

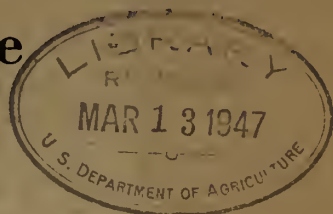
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A Survey of Milk Marketing in Milwaukee

Issued May 1937



UNITED STATES DEPARTMENT OF AGRICULTURE

Agricultural Adjustment Administration

Division of Marketing and Marketing Agreements - Dairy Section

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MARKETING INFORMATION SERIES



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III

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A SURVEY OF MILK MARKETING IN MILWAUKEE¹

INTRODUCTION

Considerable interest has been evidenced for a number of years in Milwaukee in the possibilities of operating a unified milk processing and distributing business in the city. In the spring of 1934 this interest became intensified to the point where the Common Council of Milwaukee obtained an allotment of funds from the Civil Works Administration for the purpose of studying the feasibility of centralizing milk distribution in that city. Termination of the Civil Works Administration at the end of March 1934 caused a discontinuation of the project and a temporary abandonment of the study. The field work in connection with the study later was completed under a project of the Federal Emergency Relief Administration with the Dairy Section of the Agricultural Adjustment Administration acting in an advisory capacity.

Since 1929 many milk markets have been disturbed by chaotic conditions. Numerous proposals relative to improving conditions have been advanced by various groups. Regulation as a public utility has been suggested. Municipal ownership and operation of the milk-distributing business also have been proposed.

This study summarizes certain information regarding one method proposed; controlling the milk trade by unified processing and distribution.

The major purpose of the study was to determine as nearly as possible, the feasibility of centralizing milk distribution in the city of Milwaukee. Little consideration was given to possible improvements in the present system. Obviously, it would be desirable to show the modifications which could be made to obtain more efficient milk distribution through reorganization and adjustment in the present system. In addition this could be compared with the proposed unified system.

¹ Acknowledgement is due the persons who compiled the field data for this study, among whom are: Mr. Rodger C. Crabtree, director in charge; Col. M. B. McMillan, M. D., U. S. A., retired, supervisor of the delivery and trucking studies; Miss Charlotte Kurz, supervisor of the consumers' survey; Maj. George Boyer, U. S. Army, retired, and his assistant, Mr. G. A. DeWald, designing engineers; Mr. Herman Bruns, chief architectural appraiser and designer of the unified plant; Messrs. J. Foulis, P. D. Merfield, and William Haig of the Comptroller's staff, Agricultural Adjustment Administration, accountants in charge of the distributors' audits.

Technical advisors to the survey, as conducted under the auspices of the Civil Works Administration included Dr. J. M. Tinley of the Giannini Foundation of Agricultural Economics, University of California, and formerly of the Dairy Section, Agricultural Adjustment Administration; Dr. John D. Black of Harvard University and the Brookings Institution; and Mr. Frank Walsh, formerly of the comptroller's office, Agricultural Adjustment Administration. Dr. Tinley and Dr. Paul Quintus, formerly of the Dairy Section, Agricultural Adjustment Administration and the University of Minnesota, and Dr. Warren C. Waite of the University of Minnesota, served as advisors to the Federal Emergency Relief Administration project.

Several persons on the staff of the Dairy Section, Agricultural Adjustment Administration, collaborated in the preparation of this report. Paul L. Miller, principal agricultural economist, supervised its preparation in the early stages of development, after 2 preliminary reports were submitted to the Dairy Section workers. A. J. Nixon, associate agricultural economist, handled much of the analysis and aided in drafting the report. E. W. Gaumnitz, chief, Dairy Section, and O. M. Reed, senior agricultural economist, Dairy Section, supervised the preparation of the report in the final stages of its development.

The utmost appreciation is due the milk dealers in the market whose cooperation made this study possible.

The first three parts of this report set forth factual data relative to the market, including (1) the general economic characteristics of the market, (2) market distribution, and (3) an appraisal of the present system. Part IV presents details of the organization and operation of a proposed central plant, and a comparison of this plant with the present system.

SUMMARY

Analyses of records of Milwaukee milk distributors and producers, and manufacturers of dairy products, provided the basis for the findings of this study. These basic data, as well as a brief presentation of the plans for a unified system of processing and delivery, are summarized in the following paragraphs:

1. Under normal conditions the supply of milk eligible for the bottled trade in Milwaukee is considerably in excess of the volume sold by distributors as fluid milk and cream. In addition, there is a large quantity of noninspected milk produced within an area close to the city which is used in the manufacture of dairy products. At least a part of this noninspected milk could readily be made available to the Milwaukee market for fluid purposes.

2. According to records of the Milwaukee Health Department, purchases of inspected milk by the distributors of Milwaukee increased from 262.3 million pounds in 1928 to 325.1 million pounds in 1934. Conversely, the trend of fluid-milk sales² was downward. The proportion of receipts represented by fluid sales declined from 68.9 percent in 1928 to 51.1 percent in 1934.

3. From an analysis of the consumption of dairy products by 8,796 families (33,675 individuals) during March and April 1934, it was found that virtually all families reported the use of butter, 94 percent the use of fluid milk, about 66 percent the use of cheese, but less than 24 percent reported the use of cream. The proportion of families in Milwaukee using specified dairy products during the spring of 1934 was, in general, higher than in Philadelphia but lower than in Minneapolis. Similar findings were observed with respect to per capita rates of consumption in the three cities except that the amount of canned milk and cheese consumed per person was relatively greater in Milwaukee.

Rather large differences were found between wards in the city in the rates of per-capita consumption of milk, and to an even greater extent in cream consumption. Whether these differences were due to localization of the population with respect to family characteristics and income or to sampling error has not been ascertained. However, a classification of the families interviewed on the basis of nationality, size, and income indicates that these factors have a definite influence upon the per-capita consumption of these products.

4. A classified price plan has been in effect in Milwaukee since about 1922. The type of pool employed has been that commonly called the individual-distributor pool; that is, the total value of the deliveries to any distributor depends upon the utilization of the milk by such distributor rather than upon the utilization in the market, as is the case under a market-wide pool. Proceeds of sales to distributors are prorated to producers in accordance with a base-rating plan during the first half of the year. During the second half of the year producers

² Milk sold by distributors as fluid milk.

receive composite prices for their milk. Prior to the regulation of purchase and resale prices by the milk commission of the Wisconsin State Department of Agriculture and Markets, milk used for cream was paid for at surplus or manufacturing prices, but since that time a special price has been specified for cream.

During the period 1923 to 1934 the prices paid producers for milk used for bottling purposes varied from \$2.98 per hundredweight in 1928 to \$1.84 per hundredweight in 1933. On this basis producers received 58.2 cents of the consumer's milk dollar in 1928, as compared with 47.1 cents in 1933 and 46.8 cents in 1934.

5. In view of the conditions prevailing in the market, it cannot be determined readily if distributors' margins from 1930 to 1934 were higher than those accompanying most efficient operation. However, a large increase in the number of distributors indicates that the margins during these years were sufficiently attractive to draw new capital into the business. There were but 13 licensed distributing agencies in Milwaukee in 1930 as compared with 25 in 1934.

6. On the basis of adjusted book values, the fixed assets of 20 of the 25 distributors in the market amounted to \$4,945,538.36 as of April 30, 1934. Subtracting depreciation, the value was \$2,921,747.40. These figures are exclusive of investments in byproduct plants with the exception of one ice-cream plant which was considered an integral part of its parent company. The plants excluded had the following book value as of April 30, 1934:

Total before depreciation.....	\$1, 181, 763. 43
Reserve for depreciation.....	464, 793. 62
Depreciated value.....	716, 969. 81

The reproductive value amounted to \$4,713,111.10 as of April 30, 1934. This value was determined by appraisal of the plants of these 20 companies, exclusive of the ice-cream plant noted previously, the value of furniture and fixtures, and the value of leased buildings. The sound value of these plants, i. e., reproductive value less accrued depreciation, or the serviceable value of the property to a going concern, amounted to \$3,405,948.34 as of that date. This figure includes the value of leased buildings. Considering, in addition, three companies not covered by audits, the total reproductive value of 23 companies was \$4,828,445.92 and the sound value was \$3,499,418.32. The reproductive value of all the byproduct plants owned and operated by the distributors located both in and outside of Milwaukee was \$2,486,143.45. The sound value of these plants amounted to \$1,752,957.01.

The total capital employed by the 20 distributors aggregated \$9,789,246.05 as of April 30, 1934, of which 14.4 percent was invested in current assets, 41.1 percent in net plant assets, 1.2 percent in deferred assets, and 43.3 percent in other assets. Of this amount, \$2,594,170.12 or 26.5 percent represented borrowed capital. These figures include fixed and other assets of byproduct plants as well as of fluid-milk plants, since assets, other than plant assets, applicable to the fluid-milk plants could not be distinguished.

7. The cost systems as used by a majority of distributors were found to be inadequate in expressing processing and handling costs per unit of specific products. Costs of operation and rates of return have been analyzed only on the basis of company averages, and therefore

cannot be used to determine variations in costs between products of any one company.

An analysis of the records of a number of companies indicates that there were wide variations in the rates of net profits between distributors in each of the years 1928 to 1934. At least one company showed a net profit in each of these periods, and at least one other showed a net loss in each period except 1929. Profitableness was apparently highest in 1930 when the average rate of net profits of all companies amounted to 3.13 percent of net sales. Net losses amounting to 1.64 percent of net sales were shown by the 16 companies analyzed for 1933. While the trend of net profits for all companies was downward from 1930 through 1933, certain companies were able to enhance their profitableness during these years; in 1930 the highest rate of net earnings amounted to 3.88 percent of net sales as compared with 9.17 percent in 1933.

The average rate of net earnings on total capital employed was highest in 1930, amounting to 8.75 percent, and was lowest in 1933. The net losses incurred in 1933 were 1.67 percent of total capital employed in that year. During the latter year one company earned net profits equal to 24.07 percent of its total capital, while another company lost over one-half of its total capital.

Low profitableness, in certain cases, appeared to be due to excessive charges on an overcapitalized investment. This situation was not found to be peculiar to any particular group of companies.

Operating costs, represented by expenses of processing, delivery, selling, and administration, ranged from a low of 34.65 percent of net sales in 1929 to a high of 46.54 percent of net sales in 1933. These costs varied from 3.05 cents per quart of milk receipts handled in 1929 to 4.23 cents per quart of receipts handled in 1930. In 1932, the operating costs varied from 2.35 cents to 8.65 cents per quart of milk receipts.

Measured on this basis, processing costs in the market declined between 1930 and 1934. Other operating costs remained more or less constant during this period. In view of the increased receipts handled in the market during these years, this would indicate that in general the distributors were unsuccessful in cutting their operating costs during the depression years.

Processing costs generally represent a smaller proportion of total operating costs than delivery costs. Labor costs usually constitute the largest items of expense in each of these functions. Salaries and wages of employees engaged in processing amounted to about 40 percent of total processing costs during 1932, 1933, and the first 4 months of 1934, as compared with about 75 percent of total delivery costs represented by salaries, wages, and commissions of delivery employees. Processing labor costs amounted to 5.7 percent of net sales during this period and delivery labor costs amounted to 18.6 percent of net sales.

8. The results of an analysis of milk transportation indicate a disorganized hauling system characterized by nonuniformity in hauling charges, much duplication in service, and inefficient use of equipment. Only one distributing company, which operated a fleet of its own trucks appeared to have a logical rate structure. In other cases the charges varied from 6 cents to 32 cents per hundredweight of milk, often without relationship to miles hauled. In the aggregate, the trucks used were loaded at about 62 percent of capacity during September 1934.

9. In general, the utilization of plant facilities of 22 distributors for which data are available appeared to be relatively low during April 1934. Pasteurizing capacity was used on an average of but 55.7 percent of working capacity (considered at 5.5 hours a day), bottle-filling equipment was operated at 44.7 percent of capacity, and bottle-washing equipment at 51.7 percent of capacity. The equipment was found to be utilized to a fuller extent in the large plants than in the small plants. The average volume handled daily per plant employee in the large plants was almost twice as great as in the small plants, but on the other hand, was considerably less than in the medium-sized plants. Whether this represented overspecialization in the large plants could not be determined.

10. Complete records of distribution were obtained for the 1 day, March 16, 1934. Of the total capacity of the 742 delivery vehicles used on retail and mixed routes, only 54 percent was utilized by net deliveries. The capacity of the 89 wholesale-route vehicles was more fully utilized, amounting to 62.9 percent.

A total of 11,830 miles was traveled in serving 151,686 customers on the retail and mixed routes. In making deliveries to 5,204 wholesale stops, 2,046 miles were covered. On this basis the total distance traveled in making deliveries amounted to 13,876 miles, although there were only 1,097 miles of street in Milwaukee and its suburbs. It is doubtful, however, if the 25 companies operating in the market could have reduced their delivery mileage to less than 2,200 to 3,300 miles even under most favorable conditions.

An analysis of duplication in delivery service, other than that indicated by mileage traveled in relation to miles of street in the city, shows that:

In 1,020 selected blocks of the city an average of 6.8 companies delivered in each block, with two or more companies serving every block but one. In an extreme case, 17 companies were found to be competing in the same block.

In 201 blocks studied in connection with consumption, deliveries were made by an average of 7.6 distributors per block.

None of the 25 wards (1930 basis) was served by less than nine distributors. Twenty distributors were found to be competing in wards 12 and 25. Eight or more of the 25 distributors had customers in 21 or more wards of the city, with at least two of these companies delivering in every ward. Only one company concentrated its deliveries within a single ward.

Since the delivery data were available only by company totals and not by specific routes of each company, it was impossible to show variations in route characteristics. Some routes were undoubtedly well arranged; others probably were poorly organized. On the basis of company averages, it was found that the larger companies had, in general, the better organized routes, as evidenced by low mileage and heavy concentration of customers per route. However, the delivery costs of these companies were relatively high, compared with those companies which apparently operated under less favorable route conditions, due in part to higher wage costs.

11. Detailed plans were worked out for a unified system of processing and delivery large enough to service the consumption needs of the city. Under this noncompetitive system, which presumably would be operated as a municipal enterprise, country assembly of milk would be introduced into the Milwaukee market through the establishment of five country receiving stations. While most of the processing functions would be performed at the central plant located in

the city, cream, ice-cream mix, and powdered skim milk would be prepared at the receiving stations. Wholesale, and retail deliveries would be made from the central plant in either 1-man, 2-man, or 3-man motor trucks, depending upon the characteristics of the delivery routes.

Through the operations of this system, which would involve an investment of about \$5,100,000, the designers estimated that prices to producers could be increased and prices to consumers decreased, partly because processing costs could be reduced, but mainly because delivery costs could be lowered. It was estimated that producers could be paid an increase of 14 cents per hundredweight for their milk, on the basis of 1934 price levels, while the wholesale and retail price of milk to consumers could be reduced 2 cents per quart. Prices of cream and ice cream also could be lowered. On a unit cost basis it was estimated that operating costs would amount to about 1.65 cents per quart of milk handled, as compared with 1.89 cents for the firm with lowest operating costs in the market but whose business, however, was predominantly wholesale. The average cost for 20 companies during the first 4 months of 1934 was 3.3 cents per quart. While the details are not available, it was estimated by the designers that the net income also would be sufficient to retire the investment in the existing plants in about 19 years.

Although there are some indications that costs of operation under a well-managed unified system would tend to be lower than those prevailing under competitive operations, the differences in costs must be reconciled to the following:

- (a) While the estimated costs of operation under the proposed system represent the best judgment of the designers, there is no assurance that these estimates could be translated into actual operations. In this connection, it should be pointed out that in certain aspects, particularly in the delivery function, the estimates may be insufficient to meet basic requirements.
- (b) The feasibility of introducing a system of country assembly into a market where the milk supply is obtained within a relatively short distance from the city, as well as the integration of a very large butter plant with a system designed primarily to provide for the fluid-milk requirements of the city are open to serious question.
- (c) No details were given on the methods of financing the \$5,100,000 plant and retiring the investment in the existing plants.
- (d) Successful operation of a centralized milk processing and distributing system is largely dependent upon the efficiency of management and personnel. Regardless of whether it is operated under private or public management, considerable supervision would probably be necessary to safeguard the public interest. In the absence of restraint in conduct of management there would be no assurance that the quality of products would measure up to established standards, or that the prices charged consumers or paid producers would be reasonable.

In this report consideration is given only to the possibilities of improvement under a unified system of operation. It is apparent that there are many alternatives to this proposal, each of which should be closely examined before determining conclusively the desirability of the system described herein.

I

GENERAL ECONOMIC CHARACTERISTICS OF THE MARKET

Although dairying is an important agricultural enterprise in practically all of the areas surrounding metropolitan markets, in some areas the shipments into the market are barely sufficient for local fluid requirements even at the peak of production, and the manufactured dairy products consumed in the market must be shipped in from distant sources. In other areas, shipments are sufficient to meet the local demand for fluid milk, fluid cream, and a portion and in some cases all of the demand for manufactured dairy products. Milwaukee falls into the latter category, since available records indicate that in 1931 there were 96 creameries, 144 cheese factories, and 38 condenseries in or within close proximity to the city.

SUPPLY

LOCATION OF MILK PRODUCERS

The size of a milkshed is primarily a function of the density of production within the area surrounding the city and the size of the market to be served. Milwaukee, a city of about 700,000 population including suburbs, is situated in a very dense milk-production area. In the summer of 1934 over half of the producers supplying the fluid milk trade were located within a 20-mile radius of the city and only about 1 percent resided outside the 40-mile zone as shown in table 1.

No consideration was given in this survey to the location of the cream supply. However, Mortenson found that most of the cream is shipped in from more remote areas than is milk, with the bulk originating from creameries located in Portage, Wood, Outagamie, Winnebago, Columbia, and Sheboygan Counties.³

TABLE 1.—*Number and proportion of milk shippers living at various distances from Milwaukee, June 1934*

Miles from city ¹	Number of shippers ²	Cumulative percent
Under 10.....	425	11.0
10-19.9.....	1,728	55.9
20-29.9.....	712	71.8
30-39.9.....	938	98.8
40-49.9.....	43	99.9
50 and over.....	2	100.0
Total.....	3,848	100.0

¹ As indicated by post-office address of the shipper.

² Includes some 300 patrons of a country ice-cream plant owned by one of the distributors. Per actual count by the Milwaukee Health Department.

³ MORTENSON, W. P., AN ECONOMIC STUDY OF THE MILWAUKEE MILK MARKET. Wisc. Agr. Exp. Sta. Bul. 113: p. 1, 1932.

TOTAL MILK PRODUCTION IN THE AREA

The origin of milk shipments into Milwaukee or the total production in the Milwaukee milkshed could not be set forth from data obtained in this survey. However, some indication may be obtained in this respect by an analysis of production figures by counties shown in figure 1. On the basis of the location of shippers, shown in table 1,

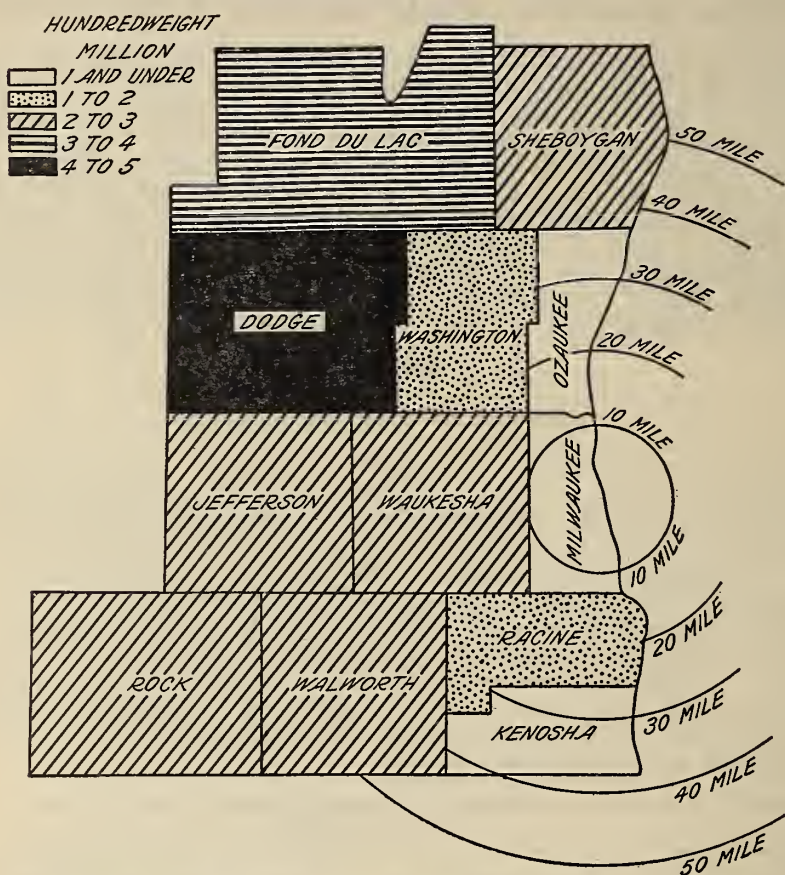


FIGURE 1.—Estimated milk production in 12 Wisconsin counties, 1931. Data from the Wisconsin Crop and Livestock Reporting Service.

it appears that the principal area of supply is contained within five counties—Milwaukee, Ozaukee, Racine, Washington, and Waukesha. In the area from which milk is received, i. e., the territory included within a 50-mile radius of the city, 12 counties are either wholly or partially included.

Total milk production in the five counties enumerated above was estimated at 647,000,000 pounds in 1919. With but two exceptions, production in each subsequent year increased from the preceding year and in 1931 exceeded 731,000,000 pounds. This represents an

average increase of about 6,500,000 pounds per year for the 13-year period under consideration, or roughly 1 percent per annum. It appears that total milk production in these counties during 1934 was slightly above that for 1931.⁴ Total milk production in the 12 counties is estimated to have amounted to 2,440,000,000 pounds in 1929, 2,490,000,000 pounds in 1930, and 2,540,000,000 pounds in 1931.

A comparison of these production figures with the receipts of Grade A and Grade B milk at Milwaukee, indicates that a larger proportion of the available supply was utilized by the distributors in the city in 1931 than in previous years. While only 39.6 percent of the total production in the five counties was shipped into the city in 1928, 47 percent was shipped to the city in 1931. Of the total production in the 12 counties, about 11.6 percent was shipped to the city in 1929, as compared with 13.5 percent in 1931.



FIGURE 2.—Seasonal variation in the volume of Grade A and Grade B milk purchased from producers, 1928-34. Purchases of Grade B milk reach a peak in June and a low point in August. Purchases of Grade A milk are similarly highest in June but lowest in November. Average daily purchases, 1928-34=100 percent.

SEASONAL VARIATION IN PRODUCTION

There are no published figures available from which the seasonal variation in milk production in the Milwaukee milkshed can be computed. For the purposes of this report, however, an analysis of milk receipts by Milwaukee distributors can be used as a measure of the seasonal variation in production of that part of the milk entering the fluid market since it is customary for fluid-milk producers to deliver their entire output to the market.

Figure 2 shows the seasonal variation in the receipts of Grade A and Grade B (market or regular) milk at Milwaukee. The curves for each classification represent average daily production, by months, for the 7-year period 1928-34.

In general, the variations in monthly production (receipts) of Grade B milk are slightly greater than those of Grade A milk. Pro-

⁴ All production figures, by counties, are based upon figures compiled by the Wisconsin Crop and Live-stock Reporting Service.

duction of each is highest in June with Grade A milk at 112.4 percent of average, as compared with 114 percent for Grade B milk. Production of the latter is lowest in August, amounting to 91 percent of the average, while production of the former appears to be better maintained during the fall months, reaching a low of 92.9 percent during November. The range of variation between low and high production is 19.5 percent for Grade A and slightly more, or 23 percent for Grade B milk.⁵

HISTORICAL DATA RELATIVE TO SALES IN THE MARKET

Of the two main classifications of milk handled in the Milwaukee market, Grade B milk, or market milk,⁶ is by far the more important. During 1934, sales of this product by distributors in the city amounted to 156,300,000 pounds as compared with 9,800,000 pounds of Grade A milk⁷ and 1,300,000 pounds of certified milk.⁸

Purchases and sales of Grade B and Grade A milk by Milwaukee distributors during the years 1928 to 1934, inclusive, and the percentage that fluid sales are of purchases, are summarized in table 2. Certified milk is not included in this tabulation, since it has no effect upon operating or market surplus, i. e., it is purchased in bottled form from producers and unsold quantities presumably are returned to them.

TABLE 2.—*Purchases and sales of Grade B and Grade A milk, and percent that sales are of purchases, 1928-34*

Year	Purchases			Fluid-milk sales			Percent sales are of purchases		
	Grade B	Grade A	Total	Grade B	Grade A	Total	Grade B	Grade A	Total
	<i>1,000,000 pounds</i>	<i>1,000,000 pounds</i>	<i>1,000,000 pounds</i>	<i>1,000,000 pounds</i>	<i>1,000,000 pounds</i>	<i>1,000,000 pounds</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
1928	236.4	25.9	262.3	166.7	13.9	180.6	70.5	53.7	68.9
1929	258.3	25.5	283.8	173.9	12.8	186.7	67.3	50.2	65.8
1930	287.2	25.5	312.7	168.5	11.4	179.9	58.7	44.5	57.5
1931	316.8	26.2	343.0	168.9	12.7	181.6	53.3	48.3	52.9
1932	315.2	24.5	339.7	171.0	12.2	183.2	54.3	49.7	53.9
1933	302.9	23.4	326.3	155.8	9.5	165.3	51.4	40.7	50.7
1934	301.4	23.7	325.1	156.3	9.8	166.1	51.8	41.5	51.1

Compiled from records of the Milwaukee Health Department.

Several significant facts are revealed by these data:

In none of the years under consideration were sales of Grade A milk equal to 10 percent of Grade B sales, and only in 1928 were purchases of the former in excess of 10 percent of the purchases of the latter.

Total sales of fluid milk⁹ decreased 14,500,000 pounds or 8 percent from 1928 to 1934 notwithstanding an appreciable increase in population.

The trend of total purchases from producers, on the other hand, was decidedly upward, with the volume purchased in 1934 equal to 124 percent of purchases in 1928.

Thus milk purchased from inspected farms which was available for sale to consumers as cream or manufactured dairy products (surplus milk) in-

⁵ For more detailed data see tables 69, 70, and 71.

⁶ Milk containing from 3 to 4 percent butterfat.

⁷ Milk of higher butterfat content (4 percent minimum) and lower bacteria count than Grade B milk.

⁸ The only classification of raw milk which can be sold within the city limits. Both Grade B and Grade A milk must be pasteurized within the city limits by the holding system.

⁹ Exclusive of certified milk sales, which increased from 266,000 pounds in 1928 to 1,297,000 pounds in 1934, or at an average annual rate of increase of about 26 percent.

creased from 81,700,000 pounds in 1928 to 159,000,000 pounds in 1934. Further details with respect to the diverging tendency in purchases and sales of fluid milk are illustrated in figure 3.

The sales of fluid cream in 1928 amounted to 44,800,000 pounds in milk equivalent and declined approximately one-fourth to 33,100,000 pounds in 1932. (See table 3.) The substantial recovery during 1933 and 1934 was no doubt attributable largely to the favorable price level and the increased purchasing power of consumers.

The disposition made of the surplus of Grade A and Grade B milk over fluid milk and fluid cream sales was not precisely ascertained. Presumably the volume of dairy products manufactured from this milk increased appreciably. In fact, it appears that the quantity of

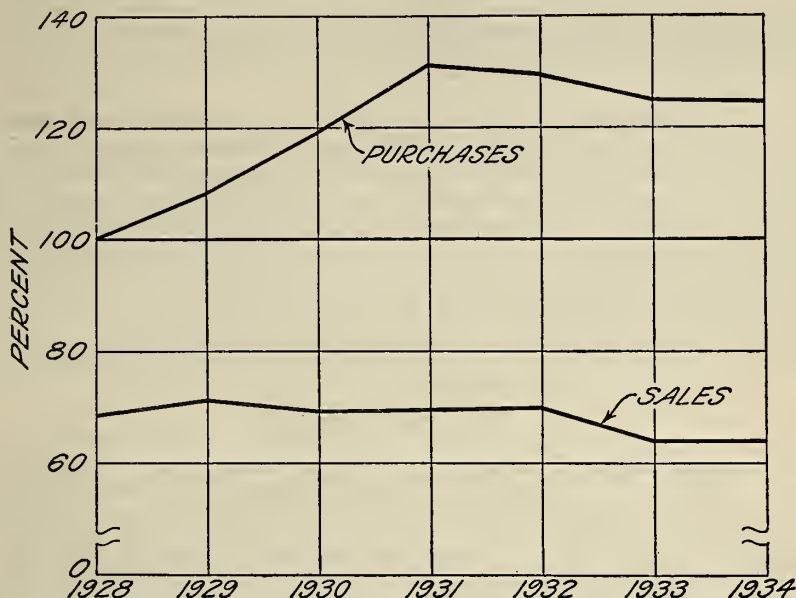


FIGURE 3.—Total purchases and total fluid sales, Grade A and Grade B milk, 1928-34. The trends in purchases and sales of Grade A and Grade B milk have been divergent, with the result that a larger proportion of the total volume purchased has been utilized as surplus milk. Purchases in 1928=100 percent.

butter, various types of cheese, condensed milk, and the like produced by the distributors from milk eligible for the bottled trade was over three times as great in each of the years 1931 to 1934, inclusive, as in 1928. However, it should be recognized that the amount of surplus indicated in table 3 does not represent the entire output of manufactured products. For the purpose of simplicity, it has been assumed that the quantity of milk sold as fluid cream was obtained entirely from Grade A and Grade B milk. Consequently, in an analysis of the volume of milk utilized for manufactured products, the amount of cream purchased by distributors from producers and creameries¹⁰ must be taken into account, as well as the quantity of noninspected milk delivered into the city exclusively for manufacturing purposes. Since the latter does not pertain directly to fluid milk marketing, however, it was omitted from consideration in this report.

¹⁰ According to the health department records, the volume of cream, in millions of pounds, so obtained was as follows: 1928, 8.6; 1929, 3.6; 1930, 3.1; 1931, 2.8; 1932, 2.2; 1933, 1.4; 1934, 1.1. The corresponding volume in milk equivalent is not known.

TABLE 3.—*Utilization of Grade A and Grade B milk other than as fluid milk, 1928-34*

Year	Sales of cream (milk equivalent) ¹	Surplus over fluid milk and cream	Percent of Grade A and Grade B purchases	
			Cream	Surplus
	1,000,000 pounds	1,000,000 pounds	Percent	Percent
1928.....	44.8	36.9	17.1	14.0
1929.....	44.0	53.1	15.5	18.7
1930.....	42.0	90.8	13.4	29.1
1931.....	38.3	123.1	11.2	35.9
1932.....	33.1	123.4	9.7	36.4
1933.....	38.9	122.1	11.9	37.4
1934.....	42.7	116.3	13.1	35.8

¹ Converted to fluid milk equivalent at the rate of 6.55 pounds of milk to 1 pound of cream. This is the simple average of the rates found by the health department for the years 1932 and 1934.

Based on Milwaukee Health Department data.

Table 4 shows the average daily volume of wholesale and retail sales of specified products during 1933 and the first 4 months of 1934. These data are based upon the sales of 16 companies in 1933 and 20 companies during the 1934 period, and for that reason cannot be directly compared. Since no sales records are available for several of the smaller distributors these figures are not fully indicative of sales in the market. However, it is believed that the figures adequately reflect the relative importance of the several products.

TABLE 4.—*Average daily volume of wholesale and retail sales of milk, cream, butter, and cottage cheese, 1933-34*

Product and unit	1933			1934 (4 months) ¹		
	Whole-sale	Retail	Total	Whole-sale	Retail	Total
Regular milk:						
Quarts.....	30, 124	129, 456	159, 580	27, 599	127, 355	154, 954
Pints.....	1, 207	10, 454	11, 661	957	6, 934	7, 891
Half pints.....	10, 441		10, 441	10, 171		10, 171
Vitamin D milk:						
Quarts.....		1, 681	1, 681		11, 784	11, 784
Half pints.....	29		29	27		27
Grade A milk:						
Quarts.....	412	9, 470	9, 882	401	10, 580	10, 981
Half pints.....	907		907	830		830
Cream, 18 percent:						
Quarts.....	359	714	1, 073	208	977	1, 185
Pints.....	163	452	615	186	827	1, 013
Half pints.....	3, 530	7, 698	11, 228	3, 594	8, 142	11, 736
Cream, 32 percent:						
Quarts.....		12	12		13	13
Pints.....		15	15		19	19
Half pints.....	830	929	1, 759	1, 012	1, 367	2, 379
Butter:						
Salted, pounds.....	1, 852	4, 771	6, 623	2, 771	2, 467	5, 238
Unsalted, pounds.....	175	24	199	181	180	361
Cottage cheese:						
Pounds.....	1, 717	206	1, 923	2, 025	277	2, 302
10-ounce jars.....	105	21	126	101	116	217

¹ January-April 1934.

Compiled from the sales records of 16 distributors for 1933 and of 20 distributors for the 1934 period.

VALUE OF SALES

A summary of the sales records of 20 distributors shows that 70.4 percent of the income from all sales during the first 4 months of 1934

was obtained from fluid milk, of which 55.9 percent was represented by retail sales. As is indicated in table 5, daily retail route sales of fluid milk amounted to \$14,290 of the total daily value of all sales of \$25,557.

TABLE 5.—*Absolute and relative value of average daily sales of dairy products during the first 4 months of 1934*

Product	Value of sales			Percentage of total sales		
	Whole-sale	Retail	Total	Whole-sale	Retail	Total
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk.....	3,690	14,290	17,980	14.5	55.9	70.4
Cream.....	1,568	1,789	3,357	6.1	7.0	13.1
Total milk and cream.....	5,258	16,079	21,337	20.6	62.9	83.5
Other products ¹	1,633	2,537	4,220	6.4	10.1	16.5
Total all products.....	6,891	18,666	25,557	27.0	73.0	100.0

¹ Certified milk and Vitamin D milk in most cases are included with "other products."

Compiled from sales records of 20 distributors. 1 company with average daily sales of \$260 is excluded since no break-down by products was given.

From these data it is estimated that the sales of fluid milk, cream, and other dairy products by all of the distributors in Milwaukee totaled between \$9,000,000 and \$10,000,000 during the year 1934. Even on lower price levels it appears that total sales exceeded \$8,000,000 in both 1932 and 1933.

VARIATION IN SALES

To a large extent the changes in annual sales just discussed are the result of varying economic conditions in which prices and the money income of consumers play an important part. In contrast with this more or less unpredictable irregularity in year-to-year sales, there are several types of regularly recurring fluctuations in the sales of milk and cream over shorter periods of time, such as month-to-month and day-to-day variations.

Fluctuations in the sales of milk and cream during the several seasons of the year arise principally from major temperature changes. Thus the amount of milk purchased by consumers during the summer months would be expected to be relatively high because of its substitution for hot drinks used by the adult population in the winter months. On the other hand, the influence of such compensating factors as the vacation movement and the preference for cold drinks other than milk during hot weather may offset any increased consumption attributable to replacement of hot drinks by milk.

Day-to-day variations in sales are also associated with temperature changes, but more consistently with the week-end holiday and the number of working people and school children who lunch away from home during week days. It would be expected that day-to-day variations in sales as explained by the last-named factor would be reflected more in the units in which milk and cream are sold rather than

in the total quantity taken; i.e., the sales of milk in pints or half pints would normally be expected to be much higher during the week days than on those days when the families have their noon meals at home.

Seasonal Variation in Sales

The seasonal variation in the sales of Grade B milk in Milwaukee is considerably less pronounced than is that for Grade A milk, certified milk, or cream. (See figure 4.) The range from the month of highest sales (March) to the month of lowest sales (July) is but 6.5 percent of the average as compared with a range of 10.9 percent for Grade A milk, 34.5 percent for certified milk, and 23.3 percent for cream. The high and low points in Grade A sales correspond with those for Grade B milk. The sales of cream, well maintained during the winter months, reach a peak in April, dip slightly in May, and reach a low point during August. (Further details are given in tables 72-75, inclusive.)

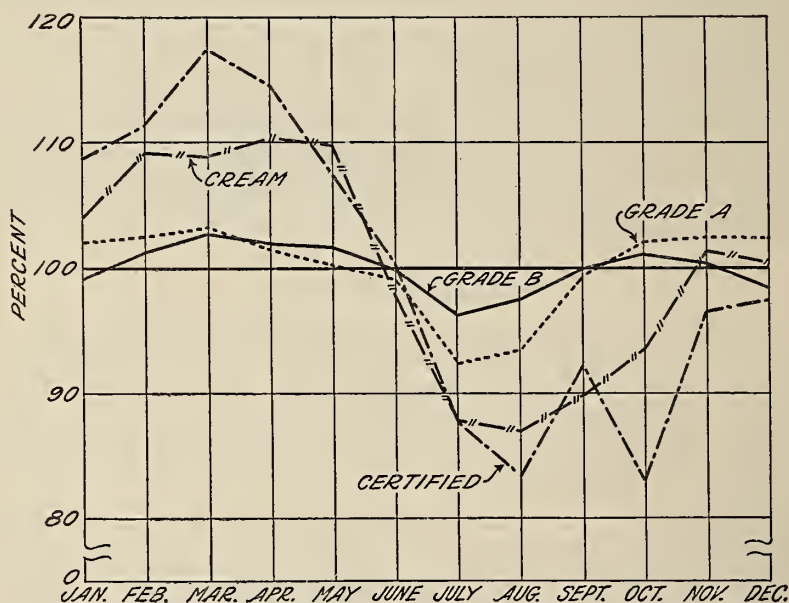


FIGURE 4.—Seasonal variation in the sales of Grade B milk, Grade A milk, certified milk and cream, 1928-34. The seasonal variation in the sales of Grade B milk is considerably less pronounced than that for Grade A milk, certified milk or cream. Variations are greater in certified milk sales than in cream sales. Average daily sales=100 percent.

Efforts to determine the normal seasonal variation in sales of the above-named products in the units most commonly sold were largely frustrated due to an insufficiency of data. The only records available are those for the full years 1932 and 1933, and the first 4 months of 1934. Since these periods are abnormal, no attempt has been made to utilize the data in deriving normal seasonal variations. In figure 5 the monthly sales of each product, measured on an average daily basis, are expressed as percentages of average daily sales of that product for the year in question and not of average daily sales for the entire period.

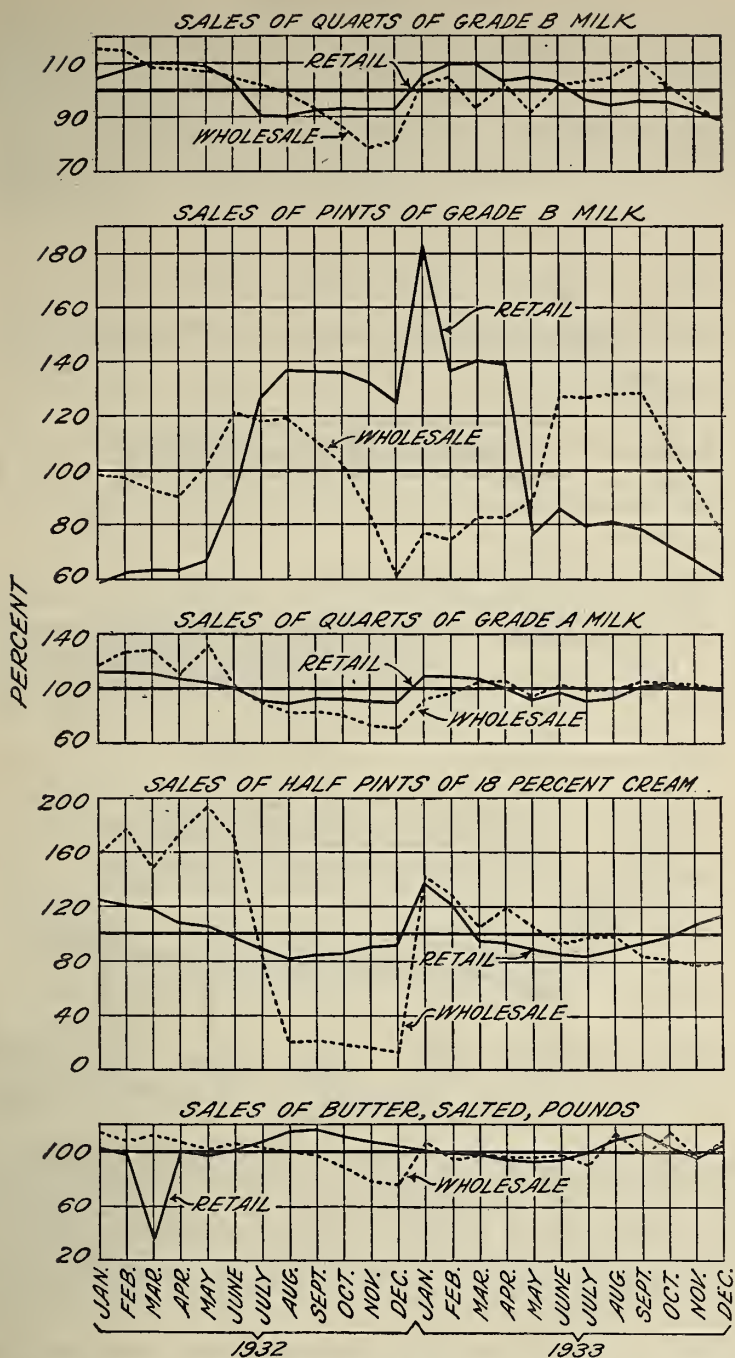


FIGURE 5.—Variations in wholesale and retail sales of specified products, 1932-33. Average daily sales for the year=100 percent.

Daily Variations in Sales

Analyses of day-to-day variations in the sale of milk and its associated products in Milwaukee are based upon detailed records of wholesale and retail sales by distributors for the week ended April 28, 1934.¹¹ These data are probably typical of daily sales throughout the year, particularly of the several classifications of milk, if there were no unusual temperatures or weather changes during the week in question.¹²

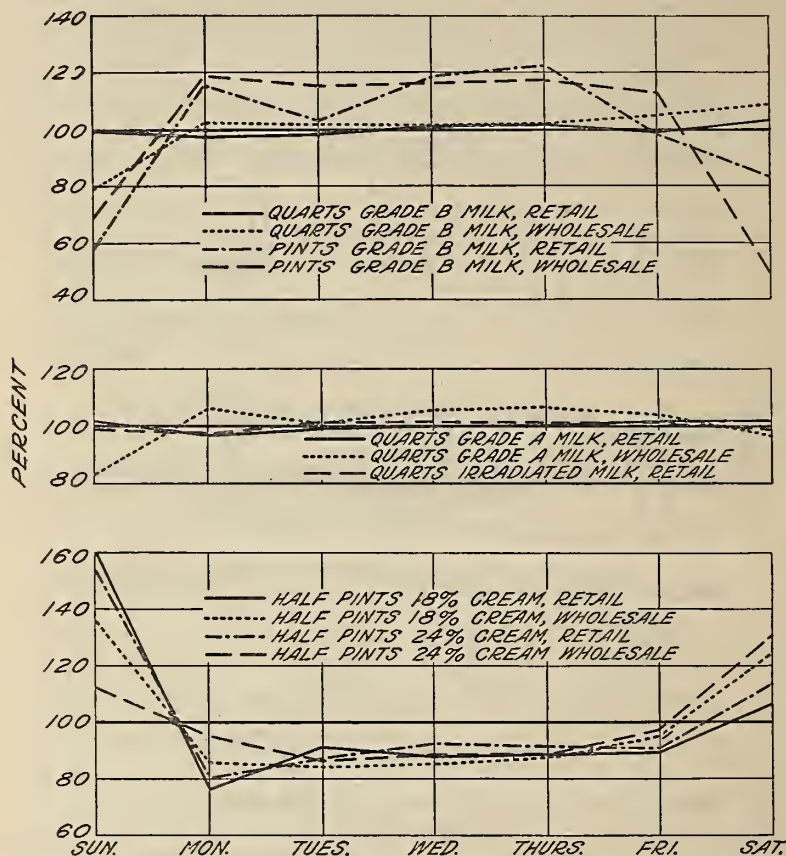


FIGURE 6.—Daily variation in sales of specified commodities, April 22-28, 1934. Average daily sales for the week = 100 percent.

Figure 6 shows the daily variation in the wholesale and retail sales of several of the more important commodities, namely, Grade B milk, Grade A milk, irradiated milk, and light cream.

Retail sales of Grade B milk in quart units showed comparatively little change from the low point on Monday to the high point on Saturday, with the extent of the daily variation for the week in question less than 6 percent of average daily sales for the week. However,

¹¹ For detailed figures of the relative importance of specific commodities sold wholesale and retail, by units, see table 76.

¹² In a study of the New York market it was found that there was relatively little variation in sales on specific days, expressed as percentages of average daily sales for the week, where records extending over the course of the year 1924 were analyzed. For details see: Ross, H. A., Technical Bulletin No. 73, U. S. Department of Agriculture, pp. 59-63, June 1928.

the fluctuations in the wholesale sales of quarts were decidedly more pronounced as evidenced by a variation of 29.7 percent of the average. Pint units of Grade B milk showed even more irregularity, with a variation of 64 percent in the retail trade and 70.1 percent in the wholesale trade.

Sales of regular milk in half pints are not depicted graphically. Sales of this product, from Monday through Friday, ranged from 114.8 percent of average daily sales for the week to 67.7 percent on Saturday and to 38.4 percent on Sunday.



FIGURE 7.—Daily variation in sales of fluid milk and cream (in milk equivalent), April 22-28, 1934. Average daily sales for the week = 100 percent.

Conversely, as is shown on the graphs, the daily wholesale and retail sales of light cream were highest on Saturday and Sunday. Wholesale sales showed less variation than retail sales, amounting to 51.3 percent and 83.4 percent of the average daily sales, respectively. Sales of heavy cream in half pints (not shown on the graph) showed the greatest variation, with a range of 107.2 percent of the average in the wholesale trade and 256.8 percent of the average in the retail trade. (Details for these products are given in tables 77 and 78.)

An inspection of these curves suggests two factors which are important from an operating point of view. It is apparent that those commodities which show relatively slight daily variations constitute

the bulk of the total volume handled. In general, high sales of one product on one day are accompanied by low sales of another product. The extent of this compensation determines the volume of milk or operating reserve needed to meet daily variations in sales. Figure 7 illustrates the extent of these compensating influences for the market as a whole. Considering the total sales of milk, the maximum variation is reduced to 11.4 percent of the average. Similarly, the curve for total cream sales (in milk equivalent) is considerably smoother than any of its component parts, with a range in sales of but 41 percent of the average. The difference between total sales of milk and cream from the high point on Saturday to the low point on Monday is but 8.5 percent of the average. Thus, for the market as a whole it was found that the operating reserve required to meet variations in the daily sales of fluid milk and cream was less than 9 percent of average daily sales for the week in question.¹³ (See also table 78.)

CHARACTERISTICS OF CONSUMPTION ¹⁴

The analysis of the characteristics of consumption in Milwaukee was undertaken for the purpose of determining the consuming habits of the residents of the city with respect to milk and other dairy products, and to secure data concerning the delivery services of distributors. The results of the delivery service analysis are presented in a subsequent section.

The sample selected included families constituting practically 100 percent of the population of 201 square blocks ¹⁵ (fig. 8). The selection of families from these scattered areas of the city is believed to have resulted in a sample fully representative of every section of the city with respect to economic status, nationality, and other pertinent characteristics.

SOURCE OF DAIRY PRODUCT PURCHASES

About four-fifths of the families interviewed reported that their supply of fresh milk was obtained exclusively from distributors' wagons. This was no doubt due to the convenience afforded thereby and the additional fact that at the time the study was conducted, milk was sold at stores and delivered retail at the same price. It might be presumed that most of the regular users of milk took advantage of this service while the irregular users purchased at stores as needed, since the families patronizing stores used about one-fourth less milk than the families who had their milk delivered to their homes. (See table 6.) However, this may have been due in part to errors in sampling; that is, store milk purchasers may have been comprised largely of small families with perhaps higher purchases of milk away from home for mid-day lunches and the like. The heaviest users were those who not only had milk delivered to their homes but who supplemented these quantities by additional purchases from stores.¹⁶

¹³ Butter is not considered a necessary adjunct to this analysis.

¹⁴ The findings presented in this section are based upon special schedules filled out by enumerators who contacted 8,796 families (representing 33,675 individuals) during the last half of March and the first part of April 1934. The sample so obtained constituted about 5.6 percent of the estimated total number of inhabitants in the city.

¹⁵ Used in preference to streets to detect, as far as possible, duplications in delivery service.

¹⁶ No purchases were reported from roadside stands. This situation probably would not have been found had the survey been conducted in midsummer.

Butter appears to have been obtained principally from stores. Undoubtedly economy in store purchases figured largely in this connection. While the quality of butter and prices charged by distributors seem to be well standardized, a comparatively wide selection of

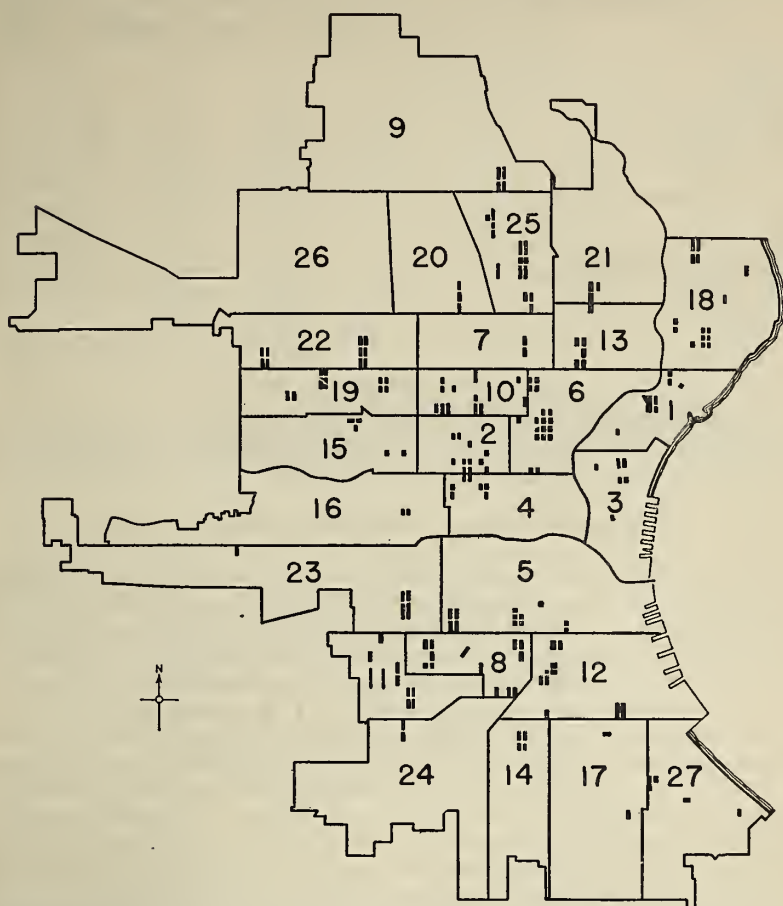


FIGURE 8.—Location of blocks surveyed, by wards, March-April 1934. (The shaded areas indicate the blocks surveyed.)

brands is offered by stores at prices somewhat below those charged on the delivery routes. In addition, stores no doubt offer a more accessible source of supply to those families who cannot maintain on hand more than a limited quantity because of inadequate refrigeration.

TABLE 6.—*Sources of fluid milk and butter used by families, and consumption per family, March and April 1934*

Product and source	Families		Consumption	
	Number	Percent	Per family ¹	Percent of total
Fluid milk:				
Distributor	6,475	73.6	1.50	79.9
Store	1,306	14.8	1.13	12.2
Store and distributor	395	4.5	2.29	7.4
Not stated	57	.7	1.14	.5
Nonusers	2,563	6.4		
Total or average	8,796	100.0	1.48	100.0
Butter:				
Store	6,494	73.8	2.19	77.3
Distributor and butter man	1,203	13.7	2.31	15.1
Store, distributor, and butter man	204	2.3	2.94	3.3
Public relief ²	577	6.6	.74	2.3
Not stated	189	2.1	2.00	2.0
Nonusers	129	1.5		
Total or average	8,796	100.0	2.09	100.0

¹ Quarts of market milk per day or pounds of butter per week.² Of this number, 467 families used canned milk exclusively.³ The rate of consumption given here is probably too low, as it is understood that no butter was distributed to relief families prior to Apr. 1, 1934, at which time a part of the schedules had already been completed.

Compiled from questionnaires submitted in March and April 1934.

SALES OF DAIRY PRODUCTS THROUGH STORES

Data relative to the sales of dairy products by stores as of Friday, March 16, 1934, were obtained from 206, or 10.5 percent, of the 1,966 stores in the city. Sales of fresh and canned milk were reported by all of the stores contacted. All but eight stores sold cream, and all but four sold butter. Only 93 stores reported selling cottage cheese.

On the basis of an average quantity of 17.6 quarts of milk and 2.2 pints of cream sold during the day in question by each store contacted, it might be assumed that about one-sixth of the fluid milk, and between one-fourth and one-fifth of the fluid cream handled daily by distributors in the market reached consumers through stores. It should be emphasized that these findings cannot be accepted as conclusive, since the representativeness of the sample, or the variability of day-to-day sales by stores, could not be measured from available data.

The average daily sales of butter and canned milk per store were 20.1 pounds and 15 tall cans, respectively.

Data with respect to fresh and canned milk sales were obtained for a comparable period in 1931 from 147 of the 206 stores. It was found that the volume of fresh milk and cream sold during the 1934 period was only about one-half of that reported for the corresponding period of 1931, amounting to 52.9 percent in the case of milk and 57.3 percent in the case of cream. The situation with respect to canned milk was in marked contrast, judging from data secured from 145 stores. These firms reported an average increase of 139.8 percent in sales in 1934 over 1931; decreases were reported by but 22 stores, which during the 1934 period handled less than 1 percent of the volume sold by these 145 stores.

An indication of the number of brands of milk, cream, and butter stocked by the several stores surveyed can be gained from table 7.

TABLE 7.—*Number of brands of milk, cream, and butter handled by selected stores, Mar. 16, 1934*

Number of brands handled	Number of stores handling			
	Milk and cream		Butter	
	Number	Cumulative percent	Number	Cumulative percent
1.....	92	44.7	61	30.2
2.....	70	78.7	76	67.8
3.....	40	88.1	46	90.6
4.....	4	100.0	18	99.5
5 and over.....	0	100.0	1	100.0
Total.....	206	100.0	202	100.0

Compiled from questionnaires obtained from stores.

UTILIZATION OF DAIRY PRODUCTS IN COMMERCIAL ESTABLISHMENTS

As a part of the analysis, 65 bakeries, 100 restaurants, and 15 hotels were contacted for the purpose of determining the uses of dairy products in commercial establishments. Largely because of an inability to determine the representativeness of the sample obtained, results depicted in table 8 serve only as a general indication of the utilization of dairy products by business concerns. Approximations of the quantities used by commercial establishments relative to the amounts used in homes cannot be satisfactorily derived from submitted data, since in any consideration of these figures account must be taken of the limitations of the sample as well as of that part of the utilization affected by nonresidents of Milwaukee, the transient population, and the patrons of Milwaukee firms residing outside the city.

TABLE 8.—*Quantities of dairy products reported used daily by selected commercial establishments, March–April 1934*

Product	Unit	Reported daily utilization			
		Bakeries ¹	Restaurants ²	Hotels ³	Total
Market milk.....	Quarts.....	146	1,674	463	2,283
Special grade milk.....	do.....		100	33	133
Skim milk.....	Gallons.....	39		3	42
Buttermilk.....	do.....	3	136	12	151
Coffee cream.....	Quarts.....		536	245	781
Whipping cream.....	do.....	68	73	26	167
Evaporated milk.....	Pounds.....	2	8	7	17
Milk powder.....	do.....	1,377			1,377
Sweetened condensed milk.....	do.....	2,204			2,204
Butter.....	do.....	364	572	247	1,183
Butter substitutes.....	do.....	446			446

¹ Includes 65, or 13.1 percent, of the 495 licensed bakeries in the city, and probably represents 25 percent of the total volume utilized.

² Based upon 100 of the 750 restaurants; includes 13.3 percent of the total number and probably a corresponding proportion of the total volume.

³ Includes 15 of the 25 restaurants operated in conjunction with hotels. Eating places operated in hotels under separate management are included with restaurants. It is estimated that the sample constitutes 60 percent of the volume used by this type of establishment.

Compiled from questionnaires submitted by specified types of establishments.

Purchases of milk by public institutions of Milwaukee County during November 1933, the most recent month for which data were obtained, amounted to about one-eighth of all sales of distributors during that month. Canned milk consumption during the same month by these institutions approximated two-fifths of the total reported for the month. The reported quantities of other dairy products used were relatively unimportant.¹⁷

AVERAGE RATES OF CONSUMPTION OF DAIRY PRODUCTS IN HOMES

The average rates of consumption of milk and other dairy products in homes, together with the proportion of the total number of families in the sample using these products, are given in table 9. Nearly all of the families in the sample reported the use of butter, over nine-tenths used fluid milk, and about two-thirds consumed hard and spread cheese. The number who purchased either light or heavy cream, however, was relatively small, with less than one-fourth of the families reporting use of these products.

TABLE 9.—*Proportion of families using specified dairy products, and family and per-capita daily consumption, March–April 1934*

Product	Unit	Percent of families using product ¹	Average daily consumption	
			Per family	Per capita
Fluid milk.....	Quarts.....	93.6	1.381	0.361
Canned milk.....	14½-ounce cans.....	49.3	.228	.059
Buttermilk.....	Quarts.....	28.0	.043	.011
Light cream.....	Pints.....	23.4	.060	.016
Heavy cream.....	do.....	21.1	.015	.004
Ice cream.....	Quarts.....	36.2	.035	.009
Cottage cheese.....	Pounds.....	43.1	.050	.013
Hard and spread cheese.....	do.....	66.5	.064	.017
Butter.....	do.....	98.5	.299	.078

¹ Based upon sample of 8,796 families.

Compiled from questionnaires submitted in March and April 1934.

A comparison of these figures with similar ones obtained for about the same period in Minneapolis¹⁸ and Philadelphia¹⁹ indicates that, in general, the proportion of families using the several products was higher in Minneapolis than in the other two cities, with Milwaukee occupying an intermediate position except as regards canned milk consumption in which it ranked first. Similar findings are observed with respect to per-capita rates of consumption, with the further exception that the average amount of cheese (hard, spread, and cottage) consumed per person was relatively highest in Milwaukee. The per-capita rate of butter consumption in Milwaukee appears to be quite high in relation to the United States average, but is slightly lower than that found in Minneapolis.

As is indicated in table 10, a large proportion of the consumers used both canned and whole milk. In the case of relief recipients this is

¹⁷ These data of the consumption of dairy products were obtained directly from persons associated with the public institutions and who were responsible for purchases.

¹⁸ Waite, Warren C., and Cox, Rex W., A Study of the Consumption of Dairy Products in Minneapolis, 1934. Univ. of Minn. Agr. Exp. Sta. Bul. 311. Table 1, p. 4, October 1934.

¹⁹ Cowden, T. K., and Sturges, Alexander, Preliminary Report on the Consumption of Fluid Milk and Other Dairy Products in Philadelphia, Pa., June 1934. Pa. Agr. Exp. Sta. Tech. Paper 659, U. S. Dept. of Agr. Cooperating. Table 1, p. 4, July 1934.

largely explained by the fact that fresh and canned milk were distributed to them in equal quantities. Those families, relief and non-relief, using only canned milk consumed an average of 0.661 can daily, while those families supplementing fresh milk with canned milk consumed 0.438 can daily. The consumption of canned milk, when applied over the total sample, amounted to 0.059 can daily per capita, which, measured in fluid milk equivalent, aggregated roughly one-sixth of the total consumption of all whole milk in homes.

TABLE 10.—*Proportion of nonrelief and relief families using whole and canned milk, March–April 1934*

Products used	Classification of families		
	Nonrelief	Relief	Total
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Whole milk only.....	53.1	11.2	49.6
Whole and canned milk.....	40.3	84.7	44.0
Canned milk only.....	5.5	3.0	5.3
Neither.....	1.1	1.1	1.1
Total.....	100.0	100.0	100.0

Compiled from questionnaires submitted in March and April 1934.

Slightly less than 10 percent of all the families interviewed reported the use of special grades of milk, namely Grade A, Vitamin D, and Certified milk. Of the total quantity of special milk consumed, 51.5 percent was Vitamin D milk. A small part of the consumption of special milk was attributed to special diets prescribed by physicians.

PER-CAPITA CONSUMPTION OF MILK AND CREAM IN VARIOUS PARTS OF THE CITY

In any large metropolitan area the per-capita consumption of milk and cream tends to vary appreciably between different sections of the city. For instance, an area populated predominately by families of low income ordinarily is found to show materially lower rates of consumption of milk, but more particularly of cream, per capita, than an area of exclusive residences. A practical difficulty arises, however, in designating geographical areas which are to be used in illustrating these differences, for the areas must of necessity be arbitrary and subject to limitations produced by the nonhomogeneous populations residing therein. In the absence of adequate statistics the results presented here must be interpreted as approximations only.

It appears that the per-capita consumption of fluid milk varied considerably between wards of the city. In ward 3, which was described as one of relatively low economic status, the average daily consumption of whole milk per person was but .500 pint, as compared with .896 pint in wards 17 and 27, and .722 pint for the city as a whole. Variations in the per-capita rates of cream consumption were considerably greater as shown in table 11.²⁰

²⁰ Precaution in the use of these data is suggested because of the uncertainty of the sample distribution within wards. For the city as a whole the sample is considered representative. It was not possible to measure the representativeness of the sample by wards, however, since the original data are not available. The sample was selected according to a 25-ward basis (as used in the 1930 U. S. census) but was subsequently tabulated on a 27-ward basis (as per the Milwaukee Election Commission). As closely as can be ascertained it included from 1 to 16 percent of the 1930 population of each ward, with an average of 5.6 percent of the number of inhabitants of each ward.

TABLE 11.—Daily per-capita consumption of milk and cream by wards, March–April 1934

Ward No.	Daily per-capita consumption			Ward No.	Daily per-capita consumption		
	Fluid milk	Cream	Milk and cream ¹		Fluid milk	Cream	Milk and cream ¹
	<i>Pint</i>	<i>Pint</i>	<i>Pint</i>		<i>Pint</i>	<i>Pint</i>	<i>Pint</i>
1.....	0.855	0.009	0.918	16.....	0.650	0.026	0.803
2.....	.688	.009	.751	17.....	.896	.029	1.032
3.....	.500	.038	.767	18.....	.816	.056	1.525
4.....	.809	.027	1.005	19.....	.512	.056	1.456
5.....	.698	.013	.789	20.....	.778	.010	.857
6.....	.653	.011	.730	21.....	.731	.020	.886
7.....	.527	.006	.569	22.....	.753	.029	.923
8.....	.773	.011	.850	23.....	.843	.031	1.061
9.....	.686	.010	.756	24.....	.726	.042	.739
10.....	.719	.013	.810	25.....	.744	.021	.891
11.....	.673	.012	.757	26 ².....	.778	.010	.879
12.....	.736	.007	.788	27.....	.896	.029	1.097
13.....	.844	.037	1.106				
14.....	.587	.002	.604	Weighted average.....	.722	.020	.891
15.....	.727	.025	.902				

¹ Cream converted to fluid milk at varying rates depending upon consumption of light and heavy cream per ward.

² The per-capita figures for ward 26 presumably represent estimates since there are no records of families interviewed in this ward.

Compiled from data secured on questionnaires submitted in March and April 1934.

FACTORS AFFECTING PER-CAPITA RATES OF CONSUMPTION OF DAIRY PRODUCTS

Factors tending to influence rates of consumption include the following: Economic status, number of children in the family, nationality, and general dietary habits.

The data included in table 12 indicate the influence of these factors. On the basis of the accepted dietary standard of 1 quart of milk a day for children, 12 years of age or under, and of 1 pint per day for persons over 12, it would be expected that, other factors remaining the same, the per-capita consumption of milk would be highest among those groups having the greatest proportion of children. The findings of this survey indicate the converse of the situation, except in the case of Italians. Taking into consideration the above-mentioned standard for an adequate diet and the rates of per-capita consumption, it appears that the deficiency in the milk diet varies inversely with economic status.

The per-capita consumption of cream is influenced by income to a much greater degree than is milk, with its use limited largely to families in the high-income brackets. Canned milk is used as a replacement for cream and, perhaps to a less extent, as a substitute for milk, particularly by those of low economic standing. The per-capita consumption of this product tends to vary inversely with the income of consumers.

TABLE 12.—*Daily per capita consumption of fluid milk, cream, and canned milk by economic groups and nationality, and proportion of children in the group, March-April 1934*

Economic group ¹ and nationality ²	Proportion of children in group ³	Daily per capita consumption		
		Fluid milk	Cream ⁴	Canned milk
	<i>Percent</i>	<i>Pint</i>	<i>Pint</i>	<i>14½ oz. can</i>
Low:				
Negro.....	23.2	0.437	0.002	0.099
Italian.....	55.0	.671	.003	.054
Other.....	29.0	.670	.008	.101
Average.....	29.4	.654	.006	.099
Intermediate:				
Negro.....	22.4	.578	.003	.087
Italian.....	30.5	.573	.003	.034
Other.....	20.1	.713	.015	.063
Average.....	20.3	.709	.014	.063
High:				
Negro.....	7.1	.550	.013	.037
Italian.....	18.2	.545	.019	.127
Other.....	14.0	.785	.039	.030
Average.....	14.0	.784	.039	.030
All groups:				
Negro.....	22.0	.497	.003	.091
Italian.....	37.5	.606	.004	.042
Other.....	19.4	.730	.021	.058
Average.....	19.7	.724	.021	.058

¹ Based mainly on rentals originally divided into 8 groups. The classification used is believed to be reasonably reflective of income groups.

² Italians and Negroes are the only groups shown separately as no significant differences were found among other nationalities or races.

³ Refers to children 12 years of age or under.

⁴ Subject to error, since 6.3 percent of the total volume consumed is not accounted for.

Computed from data secured on questionnaires submitted March-April 1934.

The daily per-capita consumption of butter in pounds by economic groups was as follows: Low .056; intermediate .077; and high .096. On a nationality basis the rates are: Negroes .044 pound; Italians .041 pound; and others .080 pound.

CONSUMER REACTION IN DEMAND WITH GIVEN CHANGES IN RETAIL PRICES

In a study of the metropolitan area of New York indications were found that a 1-cent change in the retail price of fluid milk in quarts had but slight effect on the quantities purchased, except over a relatively few weeks. A 2-cent increase in price, however, was found to be associated with an appreciable decrease in purchases.²¹ While no corresponding figures are available for the Milwaukee market it is interesting to observe the responses given by families surveyed to a possible change of 2 cents in the price of fluid milk and of a 4-cent decrease in the price of butter per pound. The results may be summarized as follows:

Thirty percent of all families surveyed stated they would use additional milk with a 2-cent decrease in price per quart. (The established price was then 9 cents per quart.) If only those families who anticipated using more milk at decreased prices are considered, the reported increase in consumption by economic groups would have been as follows: Low 78.4 percent,

²¹ Ross, H. A., op. cit., pp. 44-47.

intermediate 61.0 percent, and high 51.7 percent. Applied over the entire sample the anticipated increases according to economic groups amounted to: Low 14.3 percent, intermediate 11.1 percent, high 6.2 percent, and weighted average 10.2 percent.²²

Only 7.6 percent of the families in the sample reported that they would use less milk (averaging 39.2 percent less) if a 2-cent increase in price were effected. By reason of the limited number so reporting, total consumption on this basis would have been reduced but 2.1 percent.

The results indicate that butter consumption would have increased 15.8 percent with a 4-cent decrease in the price per pound.

In any interpretation of these data two important factors must be taken into consideration: First, the anticipated reactions are based upon 1934 levels of income; second, the reactions might be overstated relative to those which would obtain were such price changes actually to take place.

PRICE ASPECTS OF THE MARKET

ORGANIZATION OF THE SUPPLY

Mortenson states that a producers' association was organized in the Milwaukee market in 1908 which operated as a bargaining agency until about 1913.²³ Following a comparatively inactive period, a reorganization took place in 1916 but eventually proved unsuccessful, principally because of losses sustained by that association in the handling of surplus milk.

The principal existing agency, the Milwaukee Cooperative Milk Producers' Association, presumably succeeded the old association, the Milwaukee Milk and Cream Shippers' Association, about 1921.

PRICE PLANS AND METHODS OF PRORATING PROCEEDS TO PRODUCERS

Careful distinction must be made between the classified price plan of pricing milk to distributors and the base-rating plan of prorating to producers the proceeds of sales to distributors. The classified price plan sets forth the terms and conditions by which distributors are obligated to pay for milk according to the uses made thereof. It establishes uniform prices to distributors for milk going into designated uses. In Milwaukee that quantity of milk sold in bottled form commands one price, that sold as fluid cream another price, and that utilized for manufacturing purposes still another price.

There are several types of pools used in conjunction with the classified price plan which translate dealers' prices, based upon a use classification, into uniform prices to producers such as the individual distributor pool plan, and the market-wide pool with or without base rating. While the classified price plan is a method of pricing milk to distributors, the various types of pools relate to the method of prorating to producers the proceeds of sales to distributors.

A classified price plan was made effective in the Milwaukee market about 1922. Prior to that time all milk had brought the same prices, i. e., flat prices. Under the classified price plan two prices were provided: a price for milk sold as fluid milk, determined by agreement between officials of the producers' association and representatives of

²² These results appear to be in reasonable relationship with what has been observed of the elasticity of demand for milk. In this particular case a 22.5 percent decrease in price would be associated with but a 10.2 percent increase in sales.

²³ Mortenson, W. P., op. cit., p. 1.

dealers; and a surplus or manufacturing price, determined by formula,²⁴ with certain considerations for high quality.

Subsequent to December 1932, the Wisconsin Milk Control Board has entered into price negotiations. A special price also has been included for cream, which previously was purchased at the surplus or manufacturing price.

Throughout the period that the classified price plan has been in effect, producers have been paid prices as computed periodically on the basis of individual distributor pools with base rating. This plan was adopted in the Milwaukee market about 1921. The base-rating plan is still in operation although several important changes have been made in policy.

As generally used, the base-rating plan involves payment to producers in accordance with the degree to which their deliveries conform to the quantities of milk utilized for fluid purposes. A basic quantity is established by each shipper equal to his average shipments during specified periods, usually the fall months when production is relatively low. Deliveries up to his base are paid for at basic prices; deliveries in excess of base are paid for at surplus or excess prices. Producers receive fluid prices for all their base milk only in case fluid sales exactly equal total basic quantities.

Under the base-rating plan as it is operated in the Milwaukee market, basic quantities are established by each shipper equal to his average shipments during the fall months.²⁵ On the basis of limited available information, it appears that producers receive blended or base prices for base milk, and manufacturing prices for milk in excess of base during the first half of the year, and weighted average or composite prices for all milk during the second half of the year.

The total basic quantities apparently bear little relation to fluid sales. In fact, prior to 1934 it was customary to allow some tolerance on basic milk. During the first year of operation a tolerance of 100 percent was allowed. In subsequent years this was reduced from 50 to 30 percent before finally being eliminated in 1934.

The Milwaukee Cooperative Milk Producers' Association thus can be classified as a bargaining agency, with its principal purpose to secure better prices to producers. Services accruing with membership include checking of weights and tests, as well as herd testing.²⁶

PRICES PAID PRODUCERS

A comparison of the average annual prices paid for milk by distributors in Milwaukee and by condenseries in Wisconsin for the years 1923 to 1934, inclusive, is shown in table 13. While the fluid prices in Milwaukee were high compared with prices paid by Wisconsin condenseries, the surplus prices at Milwaukee were below the Wisconsin prices during each of the years under consideration and ranged from 12 cents per hundredweight in 1925 to 33 cents per hundredweight in 1928. The average prices paid by the distributors, however, were sufficiently attractive to encourage farmers to meet the relatively

²⁴ Based upon average monthly quotations of 92-score butter at wholesale in Chicago (with deductions for cost of manufacturing and selling) and the value of the skim milk for manufacture into skim milk powder, condensed skim milk, and cottage cheese.

²⁵ Shipments during August, September, October, and November were used as base months until 1931 when July was added.

²⁶ Shipments by association members in recent years presumably have constituted from two-thirds to three-fourths of the total receipts in the market.

higher costs of producing milk for fluid distribution, as is evidenced by the fact that, especially since 1930, the quantities of milk delivered into the city were considerably in excess of fluid requirements.

TABLE 13.—Average annual prices paid producers per hundred pounds of milk by distributors and Wisconsin condenseries, 1923-34

Year	Prices paid by Milwaukee distributors ¹			Prices paid by Wisconsin condenseries ²	Year	Prices paid by Milwaukee distributors ¹			Prices paid by Wisconsin condenseries ²
	Fluid	Surplus	Average			Fluid	Surplus	Average	
	Dollars	Dollars	Dollars	Dollars		Dollars	Dollars	Dollars	Dollars
1923.....	2.84	2.03	2.66	2.29	1929.....	2.97	1.83	2.66	2.12
1924.....	2.76	1.60	2.35	1.84	1930.....	2.96	1.39	2.35	1.69
1925.....	2.50	1.92	2.28	2.04	1931.....	2.48	1.01	1.84	1.25
1926.....	2.80	1.86	2.54	2.04	1932.....	³ 1.94	.74	1.33	1.92
1927.....	2.92	1.96	2.67	2.24	1933.....	1.84	.89	1.35	1.04
1928.....	2.98	1.95	2.70	2.28	1934.....	2.03	4.99	1.55	1.15

¹ Compiled from data published in the Milwaukee Milk Producer. These prices represent simple averages of monthly prices for 3.5 percent milk, f. o. b. city.

² Taken from the Wisconsin Crop and Livestock Reporter, March 1936. Annual prices were computed by weighting monthly data by milk production per cow.

³ Simple average of prices for the first 7 months only.

⁴ The simple average price paid for milk used as cream was \$1.29 per hundredweight.

RESALE PRICES AND DISTRIBUTORS' MARGINS

Reference to table 14 indicates that the average unit gross margins on milk sold in quart units at retail ²⁷ were fairly well maintained during the years 1930 to 1934 notwithstanding appreciable decreases in the retail prices. In other words, the ramifications of the economic depression probably were reflected more in returns to producers than in the gross margins on milk to distributors. While this situation was typical of many milk markets during this period, there is little basis for assuming from these data that distributors received a disproportionate share of the consumer's dollar. If processing and distribution costs were increased because of improved quality and service, then a higher proportion was perhaps justified. Since the costs of milk handling tend to remain more or less fixed, distributors receive a larger proportion of the consumer's dollar when price movements are downward.

On the other hand, there is one significant fact which should not be overlooked. As is shown at a later point, the number of distributors increased substantially from 1930 to 1934. This increase in distributors was probably due to various factors, and the margins were probably sufficiently attractive to have some importance in this connection.

²⁷ These data are probably reflective of average margins on the sales of all milk sold in retail channels but obviously not on milk sold wholesale. Margins on wholesale sales in quarts are not shown, since retail sales in quarts constitute the bulk of total sales.

TABLE 14.—Average annual purchase and retail prices of fluid milk in quarts, and distributors' margins, 1923-34

Year	Price per quart		Distributors' margin	Proportion of retail price paid to producers	Year	Price per quart		Distributors' margin	Proportion of retail price paid to producers
	Purchase ¹	Retail ²				Purchase ¹	Retail ²		
	Cents	Cents	Cents	Percent		Cents	Cents	Cents	Percent
1923.....	6.1	10.5	4.4	53.1	1929.....	6.5	11.2	4.7	58.0
1924.....	5.9	10.8	4.9	54.6	1930.....	6.3	11.4	5.1	55.2
1925.....	5.4	10.0	4.6	53.5	1931.....	5.3	10.0	4.7	53.0
1926.....	6.0	10.8	4.8	55.6	1932.....	4.0	8.3	4.3	47.8
1927.....	6.3	11.0	4.7	57.3	1933.....	4.0	8.5	4.5	47.1
1928.....	6.4	11.0	4.6	58.2	1934.....	4.4	9.4	5.0	46.8

¹ U. S. Department of Agriculture, Division of Dairy and Poultry Products. Price per 100 pounds divided by 46.5.

² U. S. Department of Labor, Bureau of Labor Statistics.

Resale prices and margins on light cream are indicated in table 15. The margins shown here are understated by the resale value of products processed from the skimmed milk. Selling prices of products in Milwaukee, exclusive of cream processed from manufacturing milk, averaged \$1.35 per hundred pounds of milk in 1932, \$1.69 in 1933, and somewhat higher, or \$1.93, during the first 4 months of 1934;²⁸ buying prices for these periods were \$0.74, \$0.89, and \$0.89, respectively. A comparison of these average purchase and resale prices shows the apparent margins to distributors on this milk to have been \$0.61 per hundredweight during 1932, \$0.80 during 1933, and \$1.04 during the first 4 months of 1934.

TABLE 15.—Average annual purchase prices and wholesale and retail resale prices of light cream in quarts, 1923-34

Year	Prices paid producers for light cream ¹	Resale prices		Distributors' margins	
		Wholesale ²	Retail ³	Wholesale	Retail
	Cents	Cents	Cents	Cents	Cents
1923.....	27.1	33.8	55.2	6.7	28.1
1924.....	21.4	34.2	53.6	12.8	32.2
1925.....	25.6	34.2	54.0	8.6	28.4
1926.....	24.8	36.5	54.8	11.7	30.0
1927.....	26.2	37.5	56.0	11.3	29.8
1928.....	26.0	39.8	60.0	13.8	34.0
1929.....	24.4	40.5	60.0	16.1	35.6
1930.....	18.6	37.0	58.4	18.4	39.8
1931.....	13.5	31.0	56.8	17.5	43.3
1932.....	10.2	25.0	50.8	14.8	40.6
1933.....	12.8	24.2	45.6	11.4	32.8
1934.....	17.2	25.0	44.4	7.8	27.2

¹ Converted from prices per hundredweight of 3.5 percent milk.

² U. S. Department of Agriculture, Bureau of Dairy and Poultry Products. Wholesale prices as reported for gallons divided by 4.

³ *Ibid.* Retail prices as reported for ½ pints multiplied by 4.

Compiled from prices published in the Milwaukee Milk Producer.

²⁸ Based upon an analysis of the records of 6 of the larger distributors for each of the 3 periods under consideration. From the total value of all sales were deducted the values of (a) fluid-milk sales (including certified milk), (b) all sales of cream, and (c) the sales of all products other than milk and cream purchased for resale. The residual values of sales were then reduced to a unit basis (hundredweights of milk) by dividing by the volume of purchases of surplus or manufacturing milk. The volume of surplus purchases was taken as the difference between total receipts of milk and cream (in milk equivalent) from all sources (per records of the distributors) and the total volume of milk and cream sold (as reported by the health department). The resulting sales figures approximate average selling prices of milk products processed from surplus receipts. The margins so obtained, however, are overstated by the same amount that the margins on cream are understated.

II

MARKET DISTRIBUTION

CHANGES IN NUMBER OF DISTRIBUTORS AND RELATIVE VOLUMES

In the foregoing sections of this report considerable attention has been devoted to a review and analysis of data pertaining to the general aspects of milk production and consumption in the Milwaukee market for the purpose of developing the background for the market as a whole. In this section the factors of market distribution are examined in order to determine the effectiveness in operation of individual firms.

The location of the main plants of 25 distributors²⁹ as of April 1934 is shown in figure 9. Thirteen subplants operated by these

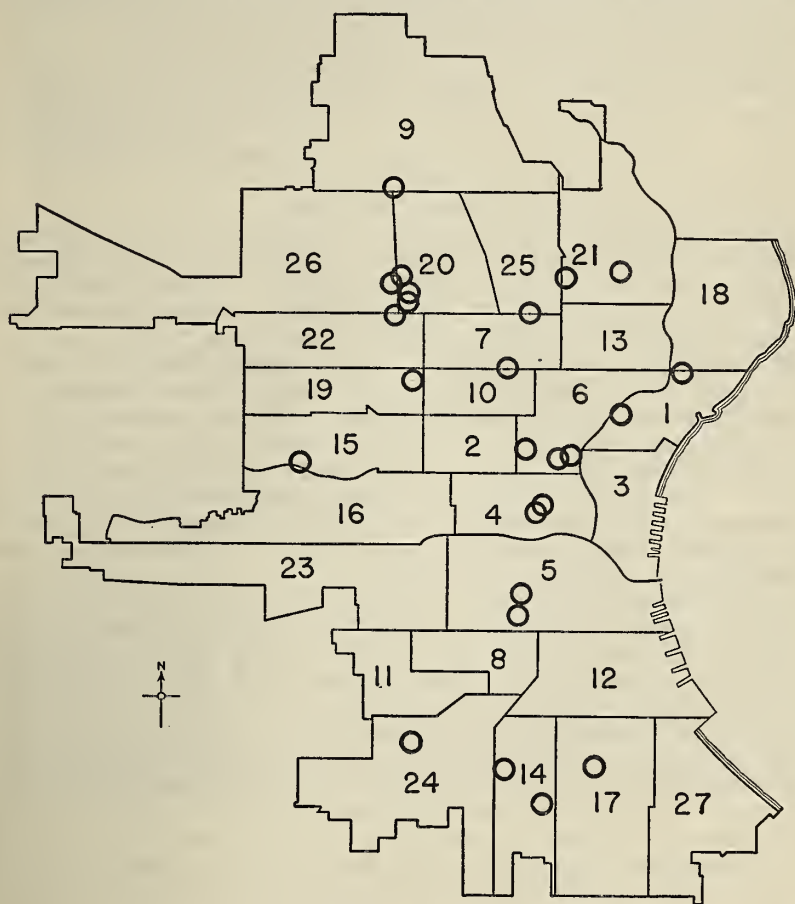


FIGURE 9.—Location of distributors' main city plants, April 1934.

²⁹ There were 18 other dealers which were regarded by the Wisconsin Department of Agriculture and Markets to be operating within the metropolitan area. They are excluded from consideration in this survey because they were small distributors operating outside of the city limits. There were no producer-distributors in business in the city.

firms are not shown in this figure. The main plants were fairly well distributed throughout the entire area, but this does not mean that their businesses were similarly distributed. Available data indicate that only one company confined its activities to the immediate vicinity of its plant.

AMOUNT OF MILK DISTRIBUTED BY NEW AND OLD COMPANIES

The milk distribution business was seriously disrupted by a combination of adverse circumstances brought about by the depression. Prices to consumers were reduced in an effort to build up or maintain a satisfactory volume of business. Consumer inducements did not stop at drastically reduced prices: premiums, rebates, and advertisement of products of unusually high quality all figured in this connection. The high rate of business entry and mortality among distributors, as well as important shifts in business between existing competitors, suggests instability in the industry at that time.

The enforcement of the pasteurization ordinance was partly responsible in reducing the number of distributors, as is indicated by a reduction in the number of distributors from over 200 in 1914 to 32 in 1920. This trend was accentuated by purchase and consolidation, so that in 1930 the number of distributing agencies was as low as 13. Since then the number of firms has increased.

According to health department records, there were 10 companies in business during 1934 which had been established prior to 1925, with several dating back to 1900 or shortly before.³⁰ Seven of these companies were corporations as of April 1934, although several had originally begun operations as individual proprietorships.

During 1930, 9 of the 10 firms noted previously handled all except about one-half of 1 percent of the total receipts of milk (Grade A and Grade B) in the market, but this relative volume decreased in each succeeding year until 1934 when it amounted to but slightly over four-fifths of the total receipts. The remainder of the volume involved in each of the 5 years under consideration was handled by two types of companies: Those which entered the market after the beginning of 1930 and remained in business through 1934; and those which came in and disappeared during the interim.

In table 16 are shown the changes from 1930 through 1934 in the relative volumes of business, as measured by yearly receipts of Grade A and Grade B milk from producers, for four groups of distributors: (1) Old companies which showed a net loss in the proportion of total market receipts handled in 1934 as compared with 1930; (2) old companies which showed a net gain during the same period; (3) new companies, i. e., firms which came into existence subsequent to January 1930 and remained in business through December 1934; and (4) other companies. The fourth group represents firms starting business after January 1930 but passing from existence prior to the end of 1934, companies originating during 1934, and new companies which came into existence sometime during the year specified but are included here since the comparisons of the above groups are based on full year figures.

³⁰ This should not be construed as an indication either that these companies had started at their existing plants at the date specified or that material changes had not been made in organization.

TABLE 16.—*Milk distributors classified according to changes in receipts, and proportion of market receipts handled, 1930-34*

Company classification	Number of companies					Proportion of market receipts handled				
	1930	1931	1932	1933	1934	1930	1931	1932	1933	1934
Old companies:						<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Gained.....	6	6	6	6	6	14.0	14.9	16.2	16.6	15.6
Lost.....	3	3	3	3	3	85.4	82.3	78.4	72.8	66.1
Total.....	9	9	9	9	9	99.4	97.2	94.6	89.4	81.7
New companies.....	0	2	3	8	8		2.4	3.9	9.8	15.3
Others ¹	4	4	8	6	8	.6	.4	1.5	.8	3.0
Total.....	4	6	11	14	16	.6	2.8	5.4	10.6	18.3
All companies.....	13	15	20	23	25	100.0	100.0	100.0	100.0	100.0

¹ Includes 1 company which should properly be considered as an old company inasmuch as it was in existence prior to 1930. Since a constant volume of receipts was reported for each of the 5 years (equivalent to 0.08 percent of the market total in 1930 and 0.07 percent for each of the other 4 years) it is excluded from the companies which gained or lost business.

² 2 of these companies with aggregate receipts equivalent to 0.4 percent of the market total for 1930 are classed as new companies after 1930.

³ 5 of these companies reporting receipts equal to 0.8 percent of the market total in 1932 are classed as new companies after 1932.

Based upon health department records.

Several significant points are revealed through the foregoing comparison. The net increase in the number of distributing agencies is quite marked, particularly in view of the volume of business acquired by these firms. The failure of distributors' margins to decline in accordance with the general level of prices probably serves as a partial explanation of this increase. Certainly the prevailing margins must have been satisfactory to those firms which were able to enter the market with but relatively small outlays of capital. This statement is substantiated by the fact that while a part of the business lost by the three old companies was captured by the six old companies which gained business, the principal competition originated from the newcomers, or in other words, from the smaller concerns.³¹

A classification of the distributors according to net changes in the fluid sales of Grade A and Grade B milk from 1930 to 1934 shows but one exception from the groupings as summarized in table 16: One company which gained relatively in receipts, declined relatively in fluid sales. Consequently, on the latter basis, the number of old companies which gained in volume is reduced from six to five, and the number that lost is increased from three to four. (See table 17.)

³¹ It is important to bear in mind that the classification of distributors on an age and change-in-volume basis serves in a general way as an indication of size of firms, as measured in terms of milk receipts. The old companies which lost business represent three of the larger participants in the market, the old companies which gained business include mainly the medium-sized concerns, while the "new companies" and "others" include mostly the smaller firms.

TABLE 17.—*Milk distributors classified according to changes in fluid milk sales, and proportion of the market sales of milk handled, 1930-34*

Company classification	Number of companies					Proportion of market sales of Grade A and Grade B milk handled				
	1930	1931	1932	1933	1934	1930	1931	1932	1933	1934
Old companies:						Percent	Percent	Percent	Percent	Percent
Gained.....	5	5	5	5	5	8.8	10.9	13.2	12.6	11.8
Lost.....	4	4	4	4	4	90.7	86.0	79.5	72.5	64.6
Total.....	9	9	9	9	9	99.5	96.9	92.7	85.1	76.4
New companies.....	0	2	3	8	8	-----	2.4	5.1	13.6	19.8
Others ¹	2	4	3	6	8	.5	.7	2.2	1.3	3.8
Total.....	4	6	11	14	16	.5	3.1	7.3	14.9	23.6
All companies.....	13	15	20	23	25	100.0	100.0	100.0	100.0	100.0

¹ Includes 1 company which properly should be considered as an old company inasmuch as it was in existence prior to 1930. Since a constant volume of receipts was reported for each of the 5 years, it is excluded from the companies which gained or lost business.

² 2 of these companies are classed as new companies after 1930.

³ 5 of these companies are classed as new companies after 1932.

Based upon health department records.

The results indicated by this grouping amplify the results given above. Again the old companies are shown to have handled practically the entire market volume in 1930. On the other hand, the relative volume of fluid sales of these companies during 1934, amounting to only slightly more than three-fourths of the fluid sales in the market, is considerably less than the proportion of receipts handled in the same year. The converse of this situation is observed for the new and other companies, i. e., the percentage of total receipts represented by surplus was lower in each year for the latter-named companies than for the old companies. This indicates that the newer firms were primarily interested in the fluid trade, and by successful competition probably made it necessary for the old companies to utilize an increasing proportion of their receipts for products other than bottled milk.

A further insight into these conditions can be gained by a consideration of the quantities of milk received and distributed as whole milk relative to the respective 1930 totals. (See table 18.)

TABLE 18.—*Changes in the volume of receipts and sales of Grade-A and Grade-B milk expressed as percentages of the respective market totals for 1930, by type or company, 1930-34*

Company classification	Receipts of milk (total market receipts for 1930=100)					Sales of fluid milk (total market sales for 1930=100)				
	1930	1931	1932	1933	1934	1930	1931	1932	1933	1934
Old companies: ¹	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Gained.....	14.0	16.4	17.6	17.3	16.2	8.8	11.1	13.4	11.6	10.9
Lost.....	85.4	90.3	85.2	75.9	68.7	90.7	86.8	81.0	66.6	59.6
Total.....	99.4	106.7	102.8	93.2	84.9	99.5	97.9	94.4	78.2	70.5
New companies.....	-----	2.6	4.2	10.2	15.9	-----	2.4	5.2	12.5	18.3
Others.....	.6	.4	1.6	.8	3.2	.5	.7	2.2	1.2	3.5
Total.....	.6	3.0	5.8	11.0	19.1	.5	3.1	7.4	13.7	21.8
All companies.....	100.0	109.7	108.6	104.2	104.0	100.0	101.0	101.8	91.9	92.3

¹ Includes 6 companies which gained and 3 which lost business as classified on the basis of receipts (per table 16), and 5 companies which gained and 4 which lost business as classified on the basis of fluid milk sales (per table 17). For the 6 companies which gained in receipts, the percentages in sales for the years 1930-34 are as follows: 12.2, 14.7, 17.1, 15.0, and 14.0, respectively. Similarly, the percentages for the 3 companies which lost in receipts are as follows: 87.3, 83.2, 77.3, 63.2, and 56.5, respectively.

Based upon health department records.

DIFFERENCES AMONG DISTRIBUTORS ON BASIS OF SALES

As would be expected in any large milk market, the type of business of the distributors varied markedly. A few firms, principally the smaller ones, confined their activities entirely to the pasteurization and sale of fluid milk and cream and disposed of their surpluses to creameries or other processing plants. Others operated fully integrated enterprises. With several exceptions, all of the companies engaged in both wholesale and retail business but in varying proportions. During the first 4 months of 1934 the value of wholesale sales in the market represented 26.8 percent of the total value of all sales, varying from a low of 12.9 percent in the case of the "other" companies to a high of 27.7 percent in the case of "new companies."³² (See table 19.)

TABLE 19.—*Wholesale sales of all products expressed as percentages of total sales, by specified groups of distributors, 1932-34*

Company classification	1932	1933	1934 (4 months) ¹
Old companies:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Gained.....	11.1	31.2	26.5
Lost.....	28.2	26.2	25.0
New companies ²	15.7	23.3	27.7
Others ³			12.9
All companies.....	26.7	26.4	26.8

¹ January-April 1934.

² Includes those firms which were in business 1 year or more prior to April 1934 but excluding the old companies.

³ Includes those firms which were in business less than 1 year prior to April 1934.

Based upon sales records of 7 companies for 1932, 15 for 1933, and 20 for the 1934 period.

PROPORTION OF MILK AND CREAM SOLD

Efforts to reduce the numerous dairy products sold by the different distributors to a butterfat basis are beset with difficulties. Special grades of milk are usually of higher butterfat content than regular milk. The fat content of cream varies, ranging from as low as 16 percent to 40 percent or more. Other products, such as cottage cheese, may be made entirely of skim milk or include fat in varying quantities. Because of this heterogeneity it was not possible to reduce the volume of all sales to a common basis. Hence in a consideration of sales on a volume basis, total sales of milk and cream, rather than total sales of all products, is used as a denominator.

The relative amounts of milk and cream sold in the market, in both wholesale and retail channels, remained almost constant during the three periods under consideration. (See table 20.) The "new" companies and those companies which gained business show very substantial increases in the relative amounts of milk and cream sold wholesale. In view of the increased volumes of these companies, this probably means that the rates of increase were greater for their wholesale sales than for their retail sales.

³² Unless otherwise specified, company classifications as used throughout the remainder of this report are based upon changes in receipts from 1930-34.

TABLE 20.—Wholesale and retail sales of milk and cream, in pounds of butterfat, expressed as percentages of total sales, by specified groups of distributors, 1932-34

Company classification and product	Wholesale			Retail			Total		
	1932	1933	1934 (4 months) ¹	1932	1933	1934 (4 months) ¹	1932	1933	1934 (4 months) ¹
Old companies:									
Gained—	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk.....	6.8	20.5	14.6	84.6	66.2	73.3	91.4	86.7	87.9
Cream.....	5.4	10.8	9.8	3.2	2.5	2.3	8.6	13.3	12.1
Total.....	12.2	31.3	24.4	87.8	68.7	75.6	100.0	100.0	100.0
Lost—									
Milk.....	20.1	19.8	18.9	60.5	62.0	61.1	80.6	81.8	80.0
Cream.....	10.4	9.1	9.3	9.0	9.1	10.7	19.4	18.2	20.0
Total.....	30.5	28.9	28.2	69.5	71.1	71.8	100.0	100.0	100.0
New companies: ²									
Milk.....	12.5	18.2	20.5	67.8	63.2	59.8	80.3	81.4	80.3
Cream.....	5.8	9.3	9.7	13.9	9.3	10.0	19.7	18.6	19.7
Total.....	18.3	27.5	30.2	81.7	72.5	69.8	100.00	100.0	100.0
Others: ³									
Milk.....			8.4			82.3			90.7
Cream.....			6.1			3.2			9.3
Total.....			14.5			85.5			100.0
All companies:									
Milk.....	19.0	19.6	18.0	62.2	62.8	64.0	81.2	82.4	82.0
Cream.....	9.9	9.3	9.4	8.9	8.3	8.6	18.8	17.6	18.0
Total.....	28.9	28.9	27.4	71.1	71.1	72.6	100.0	100.0	100.0

¹ January-April 1934.² Includes those firms which were in business 1 year or more prior to April 1934 but excluding the old companies.³ Includes those firms which were in business less than 1 year prior to April 1934.

Compiled from sales records of 7 distributors for 1932, 15 for 1933, and 20 for the 1934 period.

More detailed information with respect to the differences among distributors on the basis of route sales of milk and cream is given in table 21. As in the above case, the comparisons are based upon volumes expressed in pounds of butterfat.

TABLE 21.—Variations among distributors in wholesale and retail sales of milk and cream in specified units, 1933

Type of sale and ratio	Number of companies	Percentage that sales in specified units are of total sales of specified type										Average all companies
		10 and under	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	
Wholesale:												
Milk (quarts) as a percent of all wholesale milk.....	13						1	7	3	2		Percent 69.3
Milk (pints and $\frac{1}{2}$ pints) as a percent of all wholesale milk.....	13	10	3									8.2
Cream ($\frac{1}{2}$ pints) as a percent of all wholesale cream.....	13	1	6	2	1	3						34.3
Cream of 24 percent butterfat as a percent of all wholesale cream.....	9	2	1	1	2	1	1			1		28.3
Cream of over 24 percent butterfat as a percent of all wholesale cream.....	13	1	8	2			1	1				11.4
Retail:												
Milk (quarts) as a percent of all retail milk.....	14										14	95.8
Milk (pints and $\frac{1}{2}$ pints) as a percent of all retail milk.....	14	14										4.2
Cream ($\frac{1}{2}$ pints) as a percent of all retail cream.....	14				1	1	5	2	2	3		74.0
Cream of 24 percent butterfat as a percent of all retail cream.....	10				1	2	1	1	2	3		66.1
Cream of over 24 percent butterfat as a percent of all retail cream.....	14	4	9					1				11.2

Based upon the sales records of the distributors.

VARIATIONS IN SALES AMONG DISTRIBUTORS

At this point the sales of individual distributors are depicted in sufficient detail to indicate the relative stability of their monthly sales and the extent of the variation in their daily sales.

Except under unusual conditions the sales of different distributors will not be found to vary from one period to another in the same manner or in the same degree. In general, the variations from season to season might be expected to be in reasonable relationship with the seasonal variations for the market. At the same time, the influence of such factors as expanding or decreasing sales may entirely obscure the normal seasonality in sales of any particular distributor.

Figures 10 and 11 illustrate the foregoing situation. From these charts a detailed comparison of the volume of milk and cream sold monthly during 1933 by one large firm, two medium-sized firms, and one small firm, which were selected as being fairly typical of different groups of firms, can be secured. Two features are significant: there is a marked irregularity in the sales of the different distributors; and the abnormality of the year 1933 is of but minor importance, since the same type of variation is likely to occur in any period.

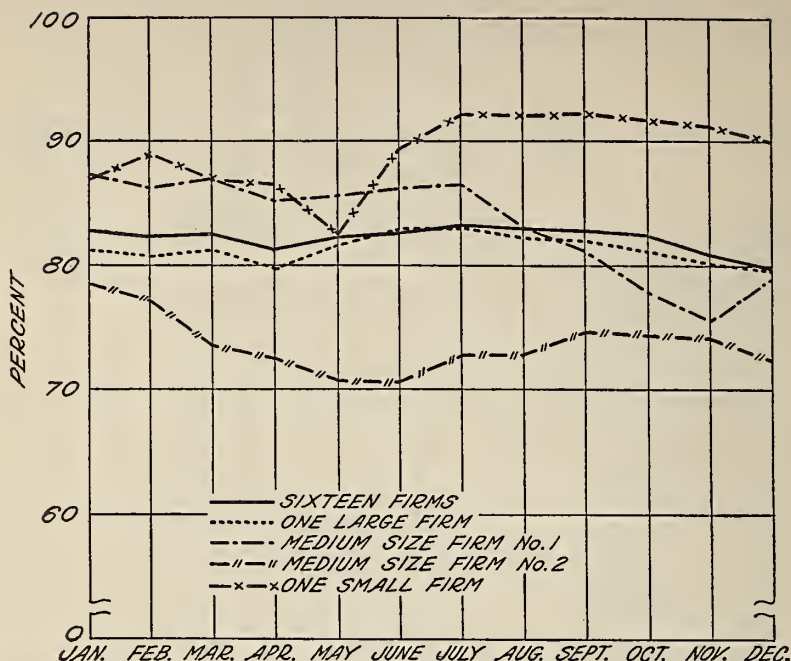


FIGURE 10.—Monthly sales of milk, expressed as a proportion of total milk and cream sales, by selected distributors, 1933.

This picture is particularly important to bear in mind when the maximum variations in monthly sales of distributors during a selected period are compared; whereas the sales of a product by one dealer may be found to be highest during that month when total sales in the market reach their peak, sales of another dealer may be relatively low during the same month.

Table 22 shows the variation in the sales of distributors from the month of their lowest sales to the month of their highest sales during 1933. These data are presented by products (milk and cream) sold wholesale and retail.

TABLE 22.—Maximum variation in the monthly sales of milk and cream sold wholesale and retail by distributors, 1933

Type of sale and product	Number of com- panies	Maximum variation ¹									Average all com- panies
		10 and under	11-20	21-30	31-40	41-50	51-70	71-100	100- 200	201 and over	
Wholesale:											Percent
Milk (regular).....	13		1	4		2	4	2			27.9
Cream—total.....	13			1	3	1	1	2	5		25.2
24 percent butterfat or less.....	13			2	3		2	2	3	1	16.3
Over 24 percent butterfat.....	13					1	5	3		4	45.7
Milk and cream.....	13	1	1	1	2	1	6		1		15.9
Retail:											
Milk (regular).....	14	1	2	2	3	2	1	1	1	1	18.0
Cream—total.....	14			1	2	1	4	3	2	1	30.2
24 percent butterfat or less.....	14		1	1	1	3	3	3		2	25.5
Over 24 percent butterfat.....	14					2	4		7	1	76.6
Milk and cream.....	14	1		5	2	2	2		1	1	18.0
Wholesale and retail:											
Milk and cream.....	15		3	4	1	3	2		1	1	14.1

¹ Difference in sales between the highest and lowest months, expressed as a percentage of average monthly sales.

Based upon the sales records of the distributors.

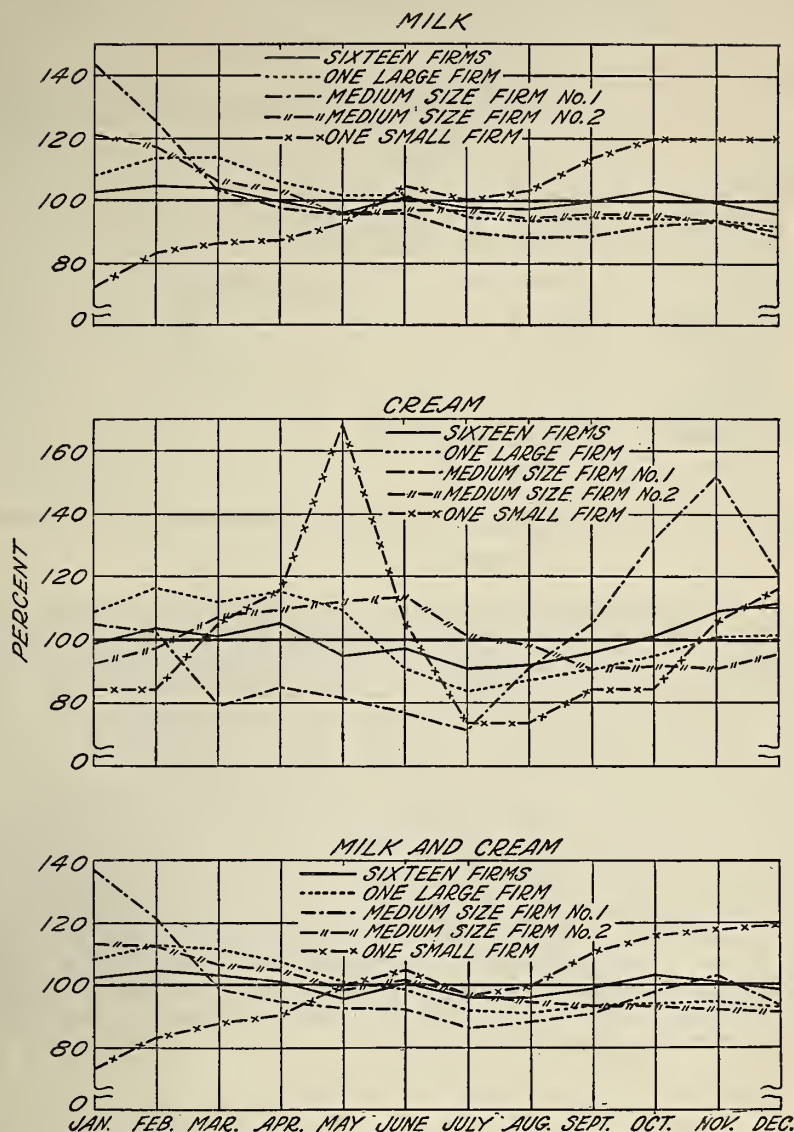


FIGURE 11.—Monthly variation in the sales of milk, cream, and milk and cream (in pounds of butterfat) of selected distributors, 1933. Average daily sales=100 percent.

Further details with respect to sales in specified units are given in table 23.

TABLE 23.—*Maximum variation in the monthly sales of milk and cream sold wholesale and retail in specified units, by distributors, 1933*

Type of sale and product	Unit	Number of companies	Maximum variation ¹										Average all companies
			10 and under	11-20	21-30	31-40	41-50	51-70	71-100	101-200	201 and over		
Wholesale:												<i>Percent</i>	
Milk, regular -----	Quarts	13	-----	1	3	-----	2	4	2	1	-----	30.8	
Milk, regular -----	Pints	10	-----	-----	-----	1	1	2	2	3	1	69.1	
Milk, regular -----	½ pints	12	-----	-----	-----	-----	2	1	2	5	2	44.6	
Cream, 24 percent butterfat -----	½ pints	8	-----	-----	1	2	2	-----	-----	2	1	25.4	
Salted butter -----	Pounds	12	-----	1	2	-----	1	2	3	3	-----	53.0	
Retail:													
Milk, regular -----	Quarts	14	1	-----	6	1	2	2	-----	1	1	15.5	
Milk, regular -----	Pints	14	-----	-----	1	1	1	2	2	3	4	124.2	
Milk, Grade A -----	Quarts	13	-----	5	2	-----	3	1	-----	1	1	20.0	
Cream, 24 percent butterfat -----	½ pints	13	-----	-----	-----	4	4	-----	1	2	2	45.4	
Salted butter -----	Pounds	13	-----	1	1	1	1	2	3	3	1	20.9	
Wholesale and retail:													
Milk, regular -----	Quarts	15	-----	4	3	1	4	1	-----	1	1	10.7	
Milk, regular -----	Pints	15	-----	1	-----	-----	2	1	2	5	4	110.3	
Cream, 24 percent butterfat -----	½ pints	14	-----	-----	1	3	3	2	-----	4	1	39.3	

¹ Difference in sales between the highest and lowest months, expressed as a percentage of average monthly sales.

Based upon the sales records of the distributors.

With but two or three exceptions the variations for individual companies are considerably greater than those for the companies in the aggregate. This indicates that: (1) while seasonal changes in consumption tend to be associated with seasonal variations in the sales of individual dealers and for the market as a whole, the principal factors determining their variations are the peculiarities of their business and the competitive aspects of milk handling; (2) the compensating influences of distributors' variations tend to make the problem of stabilized operations relatively unimportant for the market as a whole as compared with the problems confronting each distributor; (3) when related to plant, the observed variation in sales indicates that an appreciable part of the capacity required for the handling of the peak volume of business remained unused during other months of the year. This is particularly true of the smaller companies since there is a definite relationship between size of concern and stability of sales.

The range of variation in the daily sales of selected commodities by distributors is shown in table 24.

TABLE 24.—*Maximum variation in daily sales of specified commodities sold wholesale and retail, by distributors, week of Apr. 22-23, 1934*

Type of sale and product	Unit	Number of companies	Maximum variation ¹									Average all companies
			10 and under	11-20	21-30	31-40	41-50	51-70	71-100	101-200	201 and over	
Wholesale:												Percent
Milk, regular.....	Quarts.....	21	2	2	4	6	2	4	1	—	—	29.7
Do.....	Pints.....	17	—	—	—	—	1	1	5	9	1	70.1
Do.....	½ pints.....	16	—	—	—	—	—	3	7	5	1	83.1
Cream, 18 percent butterfat.....	Pint equivalent.....	20	—	—	1	2	4	5	2	4	2	36.0
Salted butter.....	Pounds.....	21	—	—	—	—	—	2	3	9	7	282.3
Plain cottage cheese.....	Pounds.....	18	—	—	—	—	—	1	3	7	7	138.1
Retail:												
Milk, regular.....	Quarts.....	20	18	2	—	—	—	—	—	—	—	5.4
Do.....	Pints.....	20	—	—	3	1	5	3	4	4	—	38.7
Milk, Grade A.....	Quarts.....	18	9	4	3	1	—	—	—	1	—	4.6
Cream, 18 percent butterfat.....	Pint equivalent.....	16	—	—	—	—	1	1	7	4	3	130.8
Cream, 24 percent butterfat.....	Pint equivalent.....	16	—	—	1	—	—	1	3	6	5	69.8
Cream, 32 percent butterfat.....	Pint equivalent.....	16	—	—	—	—	—	—	1	5	10	247.2
Salted butter.....	Pounds.....	20	—	—	—	1	3	4	6	6	—	54.1
Plain cottage cheese.....	Pounds.....	18	—	—	—	—	—	—	—	10	8	72.7

¹ Difference in sales between the highest and lowest days of the week, expressed as a percentage of average daily sales for the week.

Based upon the sales records of the distributors.

PLANT INVESTMENT AND CAPACITY

TREND OF PLANT INVESTMENT

Considering the book values of gross investment in plant,³³ i. e., before depreciation, an inspection of five of the six old companies which gained business, the three old companies which lost business, and seven of the eight "new companies" discloses that, with the exception of those old companies which lost business, the absolute values were increased during successive years from 1928 to 1934. This means that the total capital invested in plant in the market, as measured in dollars, was increased during a period when total fluid sales (and operating profits, as is shown at a later point) were on an actual decline.

Gross plant investment in the market, as measured in units of milk and cream sold, increased appreciably during the period under consideration. In 1928 there was invested 5.4 cents in plant for each quart of milk and cream sold during that year, as compared with 6.6 cents during 1933, an increase of over 20 percent, which was due partly to a decrease of about 8 percent in the volume of fluid milk and cream sales and partly to the entry of new capital into the milk distribution business.³⁴ Because of the increase in receipts in the market, however, unit-plant investment measured on the basis of receipts fails to reflect this situation. (See table 25.)

³³ Used in preference to net plant investment since it is more typical of original cost.

³⁴ Somewhat similar figures for West Virginia plants are given in: Stelzer, R. O., and Thurston, L. M., Milk Distribution Costs in West Virginia. W. Va. Agr. Exp. Sta. Bul. No. 266, pp. 28-30, 1935.

TABLE 25.—*Gross investment in distributing plants, per quart of milk received, and per quart of milk and cream sold, by specified groups of distributors, 1928-34*

Year	Gross plant investment per —							
	Quart of milk received				Quart of milk and cream sold			
	Old companies		New companies ³	All companies	Old companies		New companies	All companies
	Gained ¹	Lost ²			Gained	Lost		
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
1928.....	0.090	0.047	-----	0.048	0.107	0.053	-----	0.054
1929.....	.044	.042	-----	.042	.063	.050	-----	.051
1930.....	.041	.039	-----	.039	.056	.054	-----	.054
1931.....	.034	.039	0.052	.039	.049	.062	0.071	.061
1932.....	.033	.036	.042	.036	.048	.059	.058	.058
1933.....	.051	.039	.034	.040	.085	.067	.039	.066
1934 ⁴.....	.054	.043	.023	.042	.089	.073	.028	.067

¹ Excluding 1 company because of insufficient data. The out-of-town properties of 1 company are included for 1933 and 1934.

² Excluding properties, located outside of the city, of 1 company for all years except 1928.

³ 1 company is omitted because of insufficient data. Where found necessary to do so, part-year receipts and sales were expanded to a full-year basis in order to obtain comparable figures.

⁴ Investment as of Apr. 30, 1934, compared with total volume for 1934.

Based upon audits and health department records.

From these figures it would appear that the "new companies" were able to operate under a relatively low plant overhead per unit of volume during 1933 and 1934. During 1934 these firms had an investment per quart of milk and cream sales of about one-third that of the old companies. The elimination of the out-of-town properties of one of the companies included in the "old companies gained" classification would place these firms in an intermediate position.

To what extent changes in plant investment affected the fluid milk capacity remains unanswered. The actual capacity of such equipment as pasteurizers, bottle fillers, and bottle washers could be ascertained for only one date, April 30, 1934, from data obtained in the survey. (See table 26.)

TABLE 26.—*Operating capacity per hour of pasteurizing, bottle-filling, and bottle-washing equipment of specified groups of distributors, Apr. 30, 1934*

Company classification	Pasteurizing ¹	Bottle filling ²	Bottle washing ²
Old companies:	<i>Quarts per hour</i>	<i>Quarts per hour</i>	<i>Quarts per hour</i>
Gained.....	11,520	20,940	17,280
Lost.....	42,656	45,840	36,240
New companies ³	10,064	15,600	16,740
Others.....	5,260	7,920	7,740
All companies.....	69,500	90,300	78,000

¹ Includes capacity used only for the pasteurization of milk. Capacity is based upon the average time required to fill, hold, and empty.

² Capacity per minute multiplied by 60.

³ Excluding capacity of 1 company which refused to allow an appraisal of its equipment.

Based upon data contained in the plant appraisals of 22 distributors.

These figures represent only rough approximations of the working capacities of the equipment, largely because each unit of equipment has been considered independently of others, with the capacities determined on the basis of average rates of performance.³⁵ Obviously, such calculations do not give the actual capacity of the plant, since

³⁵ The average rates as used here represent average working capacities as distinguished from rated capacities. The former is considered the more conservative.

capacity depends not only on the size of different items of equipment but on the manner in which the various pieces of equipment are integrated.

The milk pasteurizing capacity of 22 companies was found to equal 17,375 gallons, or 69,500 quarts, an hour. This is somewhat less than the holding capacity of the equipment, since the average time required to fill and empty the tanks was taken into consideration. On the basis that the 22 companies under consideration handled about 94 percent of the volume of milk during 1934, it is probable that the total pasteurizing capacity of all companies in the market as of April 30, 1934, amounted to about 73,900 quarts an hour. These data are exclusive of the operating capacities of equipment used for pasteurizing cream and other products.

The operating capacities of bottle fillers, 90,300 quarts an hour, and bottle washers, 78,000 quarts an hour, represent the aggregate capacities of all such equipment in possession of the distributors, regardless of the uses made thereof. Proceeding on the same basis as above, it is probable that the bottling capacity for the entire market was about 96,100 quarts an hour and the total bottle-washing capacity approximately 83,000 quarts an hour. These figures represent the maximum volumes obtainable from the equipment, in spite of the fact that, in general, a larger number of pints than quarts can be handled in a given unit of time in fillers and washers. Yet in no case was the capacity for pint bottles found to equal twice the capacity for quart bottles. Hence, in the analysis of the utilization of equipment which is presented in a later section, the comparison of the volume handled expressed in quarts with the operating capacities expressed in quarts results in an upward bias in the figures with respect to percentage of capacity utilized.

Having shown plant investment in relation to quantities handled, it is desirable that the actual amounts of capital invested in plant be set forth. In this case the gross amounts invested in land, buildings, and other fixed asset accounts are shown separately, and the net amounts (after depreciation) are shown in the aggregate. (See table 27.)

TABLE 27.—Adjusted book values of fixed assets of specified groups of distributors
Apr. 30, 1934

Fixed-asset account	Old companies ¹				New companies		Others		20 companies	
	Gained		Lost							
		Pct.		Pct.		Pct.		Pct.		Pct.
Land.....	\$49,739.59	7.1	\$380,191.57	10.1	\$32,813.31	7.3	(3)	(3)	\$462,744.47	9.3
Buildings.....	231,612.21	33.1	1,543,721.49	41.2	72,405.93	16.2	\$4,625.65	9.3	1,852,365.28	37.5
Machinery and equipment.....	213,305.85	30.4	1,011,392.16	27.0	157,365.22	35.1	30,004.00	60.5	1,412,067.23	28.6
Delivery equipment.....	137,864.17	19.7	598,534.71	16.0	149,708.37	33.4	7,365.18	14.8	893,472.43	18.1
Bottles, cans, and cases.....	54,044.93	7.7	146,409.70	3.9	29,445.40	6.6	6,908.72	13.9	236,808.75	4.7
Furniture and fixtures.....	14,013.98	2.0	67,162.90	1.8	6,174.09	1.4	729.23	1.5	88,080.20	1.8
Total.....	700,580.73	100.0	3,747,412.53	100.0	447,912.32	100.0	49,632.78	100.0	4,945,538.36	100.0
Less reserve for depreciation.....	294,659.21	42.1	1,644,282.76	43.9	83,636.59	18.7	1,212.40	2.4	2,023,790.96	40.9
Net fixed assets.....	405,921.52	57.9	2,103,129.77	56.1	364,275.73	81.3	48,420.38	97.6	2,921,747.40	59.1

¹ Excluding those plants which were primarily byproducts processing units, both within and outside of Milwaukee, except the ice-cream plant of 1 company. The plants excluded had the following adjusted book values as of Apr. 30, 1934: Total before depreciation, \$1,181,763.43; reserve for depreciation, \$464,793.62; depreciated value, \$716,969.81.

² The land values as used here for 1 company represent appraised rather than book values, because of unrecalled differences between these figures.

³ It should be noted that the companies in this group leased the land occupied.

Compiled from audits of 20 distributors' books and records.

The plant values as used in this report represent adjusted book values rather than those actually recorded by the several companies. If variations from recognized and sound accounting practices were found, the auditors (field accountants of the Federal Emergency Relief Administration and the Agricultural Adjustment Administration) adjusted the book values where it was deemed proper to do so in order to make the figures of the several companies comparable. Depreciation rates and reserves were analyzed and adjustments were made in those cases where the rates did not correspond to those allowed for tax purposes by the Bureau of Internal Revenue of the United States Department of the Treasury. Adjustments in this respect were made for a majority of the companies analyzed. In addition, the fixed asset accounts of all companies but one were analyzed sufficiently to verify additions as proper charges to capital, to ascertain that credits to the accounts were properly stated, and to determine the basis of valuation. Other balance-sheet items and profit-and-loss accounts were also verified as to their reasonably proper classification and propriety. While there are recognized limitations to the use of adjusted rather than book figures in this type of analysis, especially in that they do not depict actual conditions, it is believed that the advantages outweigh the disadvantages; there is little justification in comparing the ill-kept book accounts of one firm with the properly stated and sound accounts of another.

The gross plant investment, as adjusted, of 20 of the 25 distributors in the market aggregated \$4,945,538.36 as of April 30, 1934, and after deducting reserves for depreciation, amounted to \$2,921,747.40. An undetermined value included in this total is represented by the ice-cream plant of one company which could not be segregated, since, for accounting purposes, it was considered as an integral part of that company. Byproduct plants excluded from this total had a depreciated value of \$716,969.81. The combined value of the five plants not covered by audits likewise remains unknown, but under the assumption that the plant investment per unit of volume was comparable to that of the companies for which data are available, probably amounted to less than 3 percent of the total given above.

To what extent the "new" and "other" companies purchased new equipment upon their entrance into the market has not been ascertained. On the one hand, there might be some basis for assuming that the proportion of their fixed assets represented by new equipment was high, as their reserves for depreciation as of April 30, 1934, amounted to but 18.7 percent, and 2.4 percent, respectively, of their total investments in plant. As would be expected, the plants of the old companies were depreciated to a much greater degree; the reserve for depreciation amounted to 42.1 percent of the gross plant value of the companies which gained business between 1930 and 1934, and slightly more, or 43.9 percent, of the companies which lost business during that period. On the other hand, the converse might be true since it is a usual practice to record used equipment purchases at actual cost (original cost less depreciation), which procedure in itself fails to reflect actual age or condition.

The foregoing statement is not intended to imply that either the quality of product or the effectiveness in operation was seriously affected by the age of the assets. Milk equipment allowed to deteriorate with age and wear generally is less efficient and less sanitary than new equipment, but these differences probably can be largely overcome by careful supervision and maintenance. It is probable that only the most heavily depreciated equipment was in such condition as to have any material influence in these respects. For that matter, considering the combined equipment, only about one-twelfth of all milk-handling machinery, i. e., equipment coming in contact with milk or its containers in such a way as to affect the quality of the product, was depreciated over 50 percent as of April 30, 1934, while less than one-quarter of all other machinery was depreciated over one-half of its expected life.

Subject to certain reservations which are set forth below, a more accurate analysis of depreciation can be gained from a comparison of the reproductive and sound values of plant as determined from real estate and industrial appraisal of the distributors' properties.³⁶ The first named value represents the investment which would be required to replace the existing plant new in accordance with market conditions prevailing at the time of the appraisal, due consideration being given to costs of labor, market prices, delivery of materials, freight, cartage, and installation. Sound value is defined as the actual serviceable value of the property to a going concern, that is, reproductive value less accrued depreciation.³⁷ These values are shown in table 28.

³⁶ A group of experts, appraisers, engineers, and architects, were employed for the purpose of appraising the structures and equipment of the distributing plants operated in Milwaukee. In addition, the services of a licensed real-estate broker, who had many years of experience in the city, were secured for the purpose of evaluating the land owned or occupied by the distributors.

³⁷ Three types of appraisals figured in connection with buildings. *Itemized appraisals* were obtained for a few of the companies, in which method the quantities and values were set forth, together with the piece bill listing of all materials entering into construction. In other cases the *bulked appraisal* was used, i. e., the quantities and values were set forth together with the collective or group listing of all quantities entering into construction. For the smaller plants the *descriptive appraisal* was used. Under the latter procedure the type of construction and materials used were noted and from this was computed the cubical contents, and in turn, the cubic-foot cost, including architects' fees. The cubic-foot cost was derived by itemizing similar types of constructed buildings encountered during the survey and from data gathered over a period of 20 years for such type of construction and based upon costs obtaining at the time of the appraisal. Depreciation was based upon general existing conditions of the buildings.

According to the appraisers, cubic-foot costs may be relied upon as an impartial and accurate presentation of the cost of buildings, not varying more than 5 percent above or below actual reproductive costs of construction.

The values of office furniture and equipment were not appraised.

The reproductive values of machinery and equipment were obtained from quotations, as of May 1, 1934, by letter, price lists, or in person from manufacturers. Depreciation was figured, as in the case of buildings, upon existing conditions.

TABLE 28.—*Reproductive and sound values of the plants of specified groups of distributors, Apr. 30, 1934*¹

Appraisal value and fixed asset account	20 companies covered by audits ²				3 un-classified companies	23 com-panies
	Old companies		New com-panies	Others		
	Gained	Lost				
Reproductive value:						
Land-----	\$36, 100. 00	\$290, 100. 00	\$64, 950. 00	\$44, 700. 00	\$11, 900. 00	\$447, 750. 00
Buildings:						
Owned-----	190, 398. 07	1, 507, 476. 29	194, 149. 54		4, 676. 52	1, 896, 700. 42
Leased ³ -----						
Total-----	190, 398. 07	1, 507, 476. 29	194, 149. 54		4, 676. 52	1, 896, 700. 42
Mechanical equipment:						
Factory-----	185, 527. 08	1, 054, 716. 40	158, 902. 89	49, 170. 49	55, 052. 90	1, 503, 369. 76
Delivery-----	113, 766. 39	671, 319. 78	123, 912. 50	27, 921. 67	43, 705. 40	980, 625. 74
Total-----	299, 293. 47	1, 726, 036. 18	282, 815. 39	77, 092. 16	98, 758. 30	2, 483, 995. 50
Grand total-----	525, 791. 54	3, 523, 612. 47	541, 914. 93	121, 792. 16	115, 334. 82	4, 828, 445. 92
Sound value:						
Land-----	36, 100. 00	290, 100. 00	64, 950. 00	44, 700. 00	11, 900. 00	447, 750. 00
Buildings:						
Owned-----	160, 180. 46	1, 127, 652. 82	174, 466. 92		11, 066. 68	1, 473, 366. 88
Leased-----		20, 000. 00	13, 100. 00	14, 000. 00	7, 500. 00	54, 600. 00
Total-----	160, 180. 46	1, 147, 652. 82	187, 566. 92	14, 000. 00	18, 566. 68	1, 527, 966. 88
Mechanical equipment:						
Factory-----	139, 376. 53	630, 128. 29	131, 267. 12	35, 744. 78	38, 475. 36	974, 992. 08
Delivery-----	62, 593. 08	364, 916. 73	83, 091. 46	13, 580. 15	24, 527. 94	548, 709. 36
Total-----	201, 969. 61	995, 045. 02	214, 358. 58	49, 324. 93	63, 003. 30	1, 523, 701. 44
Grand total-----	398, 250. 07	2, 432, 797. 84	466, 875. 50	108, 024. 93	93, 469. 98	3, 499, 418. 32

¹ Plants of 2 of the smallest firms were not appraised; both firms represented peddlers operating 1 route each.

² Covering the same properties as included in table 27, except that the ice-cream plant of 1 company not separated in the audits is excluded here.

³ No reproductive values were derived for leased buildings.

⁴ The mechanical equipment of 1 company was not appraised due to extensive alterations being made at the time of the survey.

Based upon plant appraisals of 23 companies.

Excluding from consideration the sound values of leased buildings, since no reproductive values were obtained for this class of property, a comparison of the total reproductive and sound values of plants, by groups of companies, indicates that accrued depreciation amounted to 24.3 percent for the "old companies—gained", 31.5 percent for the "old companies—lost", 16.3 percent for the "new companies", and 22.8 percent for the "others." Depreciation on the books was overstated, according to the appraisals, by 12.2 percent for the total of the 20 companies, or broken down in company groups, by 17.8 percent for the old companies which gained business, by 12.4 percent for those companies which lost business, and by 2.4 percent for the new companies. The book depreciation of the "other" companies, on the other hand, was understated by 20.4 percent.

A direct comparison cannot be made of the absolute figures given for the adjusted book values of plant with the sound values derived by appraisal since the latter excludes the value of furniture and office equipment, the mechanical equipment of one company, and, by far the most important, the ice-cream division of one company as included in

the adjusted book figures. However, comparison is sacrificed in this case in order to obtain that figure which probably reflects most accurately the investment in fluid-milk plants in Milwaukee. Subject to the above modifications, the sound value of the plants of the 23 companies under consideration may be set forth as \$3,499,418.32 as of April 30, 1934. Of this total, \$447,750 was invested in land, \$1,527,966.88 in buildings, and \$1,523,701.44 in mechanical equipment. The reproductive values of the same plants (but exclusive further of leased buildings having a sound value of \$54,600) for the same date amounted to \$4,828,445.92.

It should be recognized that the appraisal figures as set forth above exclude investments in nonmilk plants, whether considered as integral parts of the companies involved or operated as subsidiaries or affiliates independently of the parent companies. The reproductive and sound values of these plants, which were primarily byproduct in nature, are shown in table 29.

TABLE 29.—*Reproductive and sound values of byproduct plants owned by fluid milk distributors, Apr. 30, 1934*¹

Fixed asset account	Reproductive value	Sound value
Land ²	\$94,200.00	\$94,200.00
Buildings:		
Owned.....	1,040,704.56	822,655.03
Leased.....	(³)	4,000.00
Total.....	1,040,704.56	826,655.03
Mechanical equipment:		
Factory.....	1,216,733.28	776,957.03
Delivery.....	134,505.61	55,144.95
Total.....	1,351,238.89	832,101.98
Grand total.....	2,486,143.45	1,752,957.01

¹ Includes the 3 out-of-town plants of 1 company and its ice-cream plant, the ice-cream plant and cheese factory of a second company, the 2 out-of-town plants of a third company, and an ice-cream plant owned by a fourth company.

² The appraised value of land used by 1 ice-cream company is excluded, since it is included in table 28.

³ No reproductive values were obtained for leased buildings.

Based upon plant appraisals.

Considering total plant investment, i. e., in milk plants as well as in byproduct plants, the following totals are found:

Reproductive value:

Land..... \$541,950.00, of which \$115,150.00 was occupied but not owned.

Buildings.... 2,937,404.98, of which \$38,186.83 was invested in unused buildings.

Mechanical equipment.. 3,835,234.39

Total..... 7,314,589.37

Sound value:

Land..... 541,950.00

Buildings.... 2,354,621.91, of which \$23,798.41 was invested in unused buildings.

Mechanical equipment.. 2,355,803.42

Total..... 5,252,375.33

TOTAL CAPITAL EMPLOYED

In addition to the amounts invested in plant assets, the 20 distributors covered by audits had, as of April 30, 1934, \$1,407,708.78 invested in current assets (working capital as represented by cash, accounts and notes receivable, inventories, etc.), \$117,211.23 in deferred assets (prepaid expenses, etc.), and \$4,243,696.98 in other assets. (See table 30.) Since it was not possible to segregate that part of the working capital, deferred and other assets used in the byproduct plants from that part used in the fluid-milk plants, the net fixed assets as used here are all inclusive and amount to \$4,020,629.06. On this basis the total capital employed aggregated \$9,789,246.05.

TABLE 30.—*Total capital employed by specified groups of distributors, Apr. 30, 1934*

Asset classification	Old companies				New companies		Others		20 companies	
	Gained		Lost							
	<i>Dollars</i>	<i>Pct.</i>	<i>Dollars</i>	<i>Pct.</i>	<i>Dollars</i>	<i>Pct.</i>	<i>Dollars</i>	<i>Pct.</i>	<i>Dollars</i>	<i>Pct.</i>
Current assets -----	200,612.57	19.1	965,331.11	12.0	211,989.16	33.9	29,775.94	36.7	1,407,708.78	14.4
Other assets ¹ -----	254,253.52	24.2	3,965,128.88	49.3	23,969.58	3.8	345.00	.4	4,243,696.98	43.3
Fixed assets ² -----	1,069,862.59	101.7	4,941,805.95	61.5	447,912.32	71.6	49,632.78	61.4	6,509,213.64	66.5
Less reserve for depreciation -----	494,000.43	47.0	1,909,735.16	23.7	83,636.59	13.3	1,212.40	1.8	2,488,584.58	25.4
Net fixed assets -----	575,862.16	54.7	3,032,070.79	37.8	364,275.73	58.3	48,420.38	59.6	4,020,629.06	41.1
Deferred assets -----	20,983.50	2.0	68,514.35	.9	25,072.28	4.0	2,641.10	3.3	117,211.23	1.2
Total assets -----	1,051,711.75	100.0	8,031,045.13	100.0	625,306.75	100.0	51,182.42	100.0	9,789,246.05	100.0

¹ Includes such items as intercompany accounts receivable; receivables from officers, employees, and closed banks; sales contracts; stocks and bonds; trade marks and patents. The books of 1 firm recorded trade marks, patents, and items of similar nature at a value considerably in excess of its net fixed assets.

² Byproduct plants included.

Based upon the audits of the books of 20 distributors.

The composition of total capital varied widely between the several company groups. Thus, other assets represented, on an average, only slightly less than one-half (49.3 percent) of all capital employed by the old companies which lost business, whereas this was a relatively unimportant item to the "other" and "new" companies. On the other hand, the "new" and "other" companies retained a larger proportion of their total capital as working capital than did the old companies. While the latter would indicate that the smaller companies ("new" companies and "others") were in a better position, relatively, to liquidate their obligations from working capital than the larger companies, the fact must not be overlooked that at least a part of the other assets consisted of investments which could be made available for this purpose.

CAPITAL STRUCTURE

Of the 20 distributors for which accounting data were obtained, 16 represented independent corporations or those affiliated with National-wide organizations, and 4 were proprietorships of both the single proprietorship and partnership types. The 20 firms had a net worth as of April 30, 1934, of \$7,195,075.93, of which \$7,145,103.54 constituted the capital structure of the incorporated firms, and \$49,972.39

represented the proprietary equity of the 4 proprietorships. As indicated previously, the total capital employed by these companies as of that date aggregated \$9,789,246.05. On this basis \$2,594,170.12, or 26.5 percent, of the total investment was borrowed capital.

This average percentage of indebtedness is changed considerably if one large company with an extremely favorable debt position is excluded, and increases to 61 percent for the 19 remaining companies. Of these 19, 1 company had a ratio of but 15.6 percent, as contrasted with 114.4 percent for another. Six of the companies showed an indebtedness of over 70 percent of their total capital.

On a group basis, the old companies which lost business had the best debt position, amounting to but 23.3 percent. This proportion was somewhat greater for the old companies which gained business, amounting to 34.8 percent. On the other hand, the total liabilities of the "new" companies aggregated 47.6 percent of their combined assets, and considerably more, 74.5 percent, in the case of the "other" companies.

Current liabilities constituted the largest item of indebtedness for each of the several company groups except the old companies which lost business, in which case amounts owing to parent and affiliated companies or branches were largest. In fact, the entire debt of the "others" group was represented by unsecured or trade accounts payable. The fixed debt of the old companies which gained business averaged 5.7 percent of their capital, as compared to 2.2 percent for the old companies which lost business and 4.3 percent for the "new" companies.

The total net worth of the 16 corporations amounted to \$7,145,103.54 as of April 30, 1934, and was divided as follows: Common and preferred stock \$6,112,970.28; and surplus \$1,032,133.26. (See table 31.) It will be noted that a very large proportion of the total capital stock outstanding, and an even larger proportion of the total surplus, was attributable to the old companies which lost business.

TABLE 31.—*Net worth of 16 incorporated distributors, classified by company groups, Apr. 30, 1934*

Net worth account	Old companies		New companies	Others	16 companies
	Gained	Lost			
Capital stock outstanding:					
Common.....	\$511, 171. 01	\$5, 163, 215. 00	\$243, 302. 00	\$24, 697. 27	\$5, 942, 385. 28
Preferred.....	66, 885. 00	30, 000. 00	68, 500. 00	5, 200. 00	170, 585. 00
Total.....	578, 056. 01	5, 193, 215. 00	311, 802. 00	29, 897. 27	6, 112, 970. 28
Surplus.....	69, 092. 56	967, 464. 85	6, 987. 64	11, 411. 79	1, 032, 133. 26
Total capital stock and surplus..	647, 148. 57	6, 160, 679. 85	318, 789. 64	18, 485. 48	7, 145, 103. 54

¹Represents a deficit.

Based upon audits of the distributors' books.

Interesting differences were noted with respect to the several issues of preferred stock outstanding. In general, the rate of dividends specified varied from 6 to 8 percent for each share of \$100.³⁸ As is characteristic of most preferred stocks, the holders were prohibited from exercising managerial rights, as the privilege to vote was restricted to the common stockholders, except in the case of default of

³⁸ Several of the issues were divided into \$50 shares.

dividend payments, and in certain cases to an increase in capitalization. One issue was identified as being participating as to excess profits after the payment of preferred and common dividends at fixed rates. Only one of the several issues was precisely defined as being cumulative.

RATIO ANALYSIS OF COMPARATIVE BALANCE SHEET DATA

Comparative balance sheet data for periods prior to April 30, 1934, are not included in this report because of the limited number of companies for which data were obtained for 1933 and earlier years and because the asset, liability, and proprietary accounts are more significantly set forth by means of ratio analysis. Hence the 1934 figures, as well as those for earlier periods, are analyzed by seven ratios. (See tables 32 to 38, inclusive.) The first four of these are termed static ratios and express the interrelations among the elements of the balance sheet. The last three are dynamic ratios, or, in other words, indications of the quantitative relationships existing between selected items of the balance sheet and income statement. Reference to the explanatory footnotes included with each table will aid in an interpretation of these ratios.

TABLE 32.—*Frequency distribution of the current assets of distributors expressed as a percentage of their current liabilities, Dec. 31, 1928-33, and Apr. 30, 1934*

Date	Number of companies	Percentage							Average all companies
		50 and under	51-80	81-110	111-140	141-170	171-200	201-230	
									Percent
Dec. 31, 1928.....	3	2	-----	-----	1	-----	-----	-----	94.1
Dec. 31, 1929.....	4	2	1	-----	1	-----	-----	-----	99.5
Dec. 31, 1930.....	5	2	1	1	-----	1	-----	-----	94.0
Dec. 31, 1931.....	7	1	3	1	2	-----	-----	-----	99.5
Dec. 31, 1932.....	14	6	3	2	-----	2	-----	1	117.3
Dec. 31, 1933.....	16	4	5	3	2	-----	1	-----	105.0
Apr. 30, 1934.....	20	5	8	1	3	1	1	1	111.8

This ratio is an estimate of the ability of the business to liquidate current obligations from working capital. In general, the minimum requirement of a satisfactory ratio for any type of business is 100 percent.

Computed from data contained in audits of the distributors' books.

TABLE 33.—*Frequency distribution of the net worth of distributors expressed as a percentage of their total liabilities, Dec. 31, 1928-33, and Apr. 30, 1934*

Date	Number of companies	Percentage							Average all companies
		40 and under	41-80	81-120	121-160	161-200	201-240	241-280	
									Percent
Dec. 31, 1928.....	3	-----	2	1	-----	-----	-----	-----	56.2
Dec. 31, 1929.....	4	2	1	1	-----	-----	-----	-----	14.3
Dec. 31, 1930.....	5	-----	2	2	-----	-----	1	-----	53.6
Dec. 31, 1931.....	7	-----	1	3	1	-----	1	-----	62.9
Dec. 31, 1932.....	14	1	5	2	3	-----	1	1	290.0
Dec. 31, 1933.....	16	4	2	3	2	2	1	-----	275.2
Apr. 30, 1934.....	20	5	4	4	2	2	1	2	277.4

This ratio indicates the proprietary equity relative to the equity of creditors. Thus, a ratio of 100 percent indicates that 50 percent of the total capital is represented by indebtedness. Similarly, a ratio of less than 100 percent indicates that over 50 percent of total capital is represented by indebtedness, and vice versa.

Computed from data contained in audits of the distributors' books.

TABLE 34.—*Frequency distribution of the net fixed assets of distributors expressed as a percentage of their net worth, Dec. 31, 1928-33, and Apr. 30, 1934*

Date	Number of companies	Percentage							Average all companies
		30 and under	31-45	46-60	61-75	76-90	91-110	111-125	126 and over
Dec. 31, 1928	3			2	1				Percent 50.0
Dec. 31, 1929	4	1	1	1	1				17.4
Dec. 31, 1930	5		2			1			46.1
Dec. 31, 1931	7		1		3		2	1	51.9
Dec. 31, 1932	14	1	3	2		4	1		55.9
Dec. 31, 1933	16	3	1	1	4	1	2	2	56.6
Apr. 30, 1934	20	3	3	1	4	3	2	1	55.9

The comparison thus effected is important primarily as an indication of the investment in plant relative to the proprietary equity.

Computed from data contained in audits of the distributors' books.

TABLE 35.—*Frequency distribution of the net worth of distributors expressed as a percentage of their outstanding capital stock, Dec. 31, 1928-33, and Apr. 30, 1934*

Date	Number of companies	Percentage							Average all companies
		50 and under	51-75	76-100	101-125	126-150	151-175	176-200	201 and over
Dec. 31, 1928	3	1			1			1	Percent 83.3
Dec. 31, 1929	4	1				1			110.5
Dec. 31, 1930	4	1							331.8
Dec. 31, 1931	6		1	1	1				212.0
Dec. 31, 1932	11	1	2	3	2			1	83.3
Dec. 31, 1933	13	2	2	4	1	1	2		190.5
Apr. 30, 1934	16	2	3	6	1	1	1	1	116.9

This ratio involves the several phases of the proprietary equity, and is an indication of the relative amount of surplus, since net worth equals the outstanding capital stock plus surplus. Hence a ratio of more than 100 percent suggests a surplus, while one of less than 100 percent indicates a deficit. The large increase in the average of all companies from 1929 to 1930 is due principally to the heavy capital surplus resulting from the financing operations of 1 company.

Computed from data contained in audits of the distributors' books.

TABLE 36.—*Frequency distribution of the net sales of distributors expressed as a percentage of their net fixed assets, Dec. 31, 1928-33, and Apr. 30, 1934*¹

Date	Number of companies	Percentage							Average all companies
		100 and under	101-150	151-200	201-250	251-300	301-350	351 and over	
Dec. 31, 1928	3				1		1	1	Percent 408.6
Dec. 31, 1929	4			1		1		2	222.3
Dec. 31, 1930	4					1		3	372.1
Dec. 31, 1931	7		2				2	3	305.2
Dec. 31, 1932	14	1	1		2	4		6	272.9
Dec. 31, 1933	16	1	2		1	3	3	6	243.9
Apr. 30, 1934	20	6	7	3	2		1	1	87.3

¹ Net sales for the years (part-year figures expanded to full-year basis for comparability) ending Dec. 31, 1928-33, divided by comparable end-of-year fixed assets. The 1934 ratios involve net sales for the first 4 months (or expansions to 4 months where necessary) divided by fixed assets as of Apr. 30, 1934; for rough comparisons with previous years, multiply the percentages indicated for 1934 by 3.

These ratios are measures of gross business relative to plant investment. A ratio of 100 percent indicates a turnover of plant investment once a year, while one of 400 percent indicates a turnover of plant 4 times a year, or once in 3 months. As such, a rough measure is obtained of managerial ability.

Computed from data contained in audits of the distributors' books.

TABLE 37.—*Frequency distribution of the net sales of distributors expressed as a percentage of their total capital employed, Dec. 31, 1928-33, and Apr. 30, 1934*¹

Date	Number of companies	Percentage							Average all companies
		50 and under	51-100	101-150	151-200	201-250	251-300	301 and over	
Dec. 31, 1928.....	3				1		1	1	<i>Percent</i> 282.7
Dec. 31, 1929.....	4				2			2	159.9
Dec. 31, 1930.....	4				1		1	2	282.4
Dec. 31, 1931.....	7		2			2		3	230.2
Dec. 31, 1932.....	14		2	2	3	2	1	4	116.2
Dec. 31, 1933.....	16		1	2	4	2	2	5	101.3
Apr. 30, 1934.....	20	4	10	4	1	1			35.9

¹ Net sales for the years (part-year figures expanded to full-year basis for comparability) ending Dec. 31, 1928-33, divided by comparable end-of-year total capital. The 1934 ratios involve net sales for the first 4 months (or expansions to 4 months where necessary) divided by total capital as of Apr. 30, 1934; for rough comparisons with previous years multiply the percentages indicated for 1934 by 3.

This ratio is an indication of total assets turnover and is supplementary to the ratio of net sales to net fixed assets.

Computed from data contained in audits of the distributors' books.

TABLE 38.—*Frequency distribution of the net sales of distributors expressed as a percentage of their net worth, Dec. 31, 1928-33, and Apr. 30, 1934*¹

Date	Number of companies	Percentage							Average all companies
		100 and under	101-200	201-300	301-400	401-500	501-600	601 and over	
Dec. 31, 1928.....	3					1		2	<i>Percent</i> 816.5
Dec. 31, 1929.....	4					1		3	1,276.9
Dec. 31, 1930.....	4					1		3	817.6
Dec. 31, 1931.....	7		2			1	1	3	596.2
Dec. 31, 1932.....	14	1	2	2	2	2	1	4	156.2
Dec. 31, 1933.....	16		2	2	2	4	1	7	133.1
Apr. 30, 1934.....	20	5	7	4	1		1	2	48.8

¹ Net sales for the years (part-year figures expanded to full-year basis for comparability) ending Dec. 31, 1928-33, divided by comparable end-of-year net worth. The 1934 ratios involve net sales for the first 4 months (or expansions to 4 months where necessary) divided by net worth as of Apr. 30, 1934; for rough comparisons with previous years multiply the percentages indicated for 1934 by 3.

Net sales expressed as a percentage of net worth measures numerically the turnover of the proprietary equity; the resulting ratios suggest the profitability of investment over a long-time period.

Computed from data contained in audits of the distributors' books.

RESULTS OF OPERATION AND NET EARNINGS

In this section the income statements are analyzed in sufficient detail to show the outstanding characteristics of operation. Costs and profits, except for one firm, are reduced to a relative or unit basis in order to minimize the noncomparability of the income statements,³⁹ and to facilitate direct comparisons of operations between years. The latter is especially important because of the varying number of companies for which data are available for the several periods under consideration.

³⁹ The nonuniformity in the accounting systems used was particularly noticeable with respect to the profit and loss items. While adjustments were made by the auditors for some accounts (as, for instance, depreciation) the accounting records were so meager for others as to prohibit reduction of the data of the several companies to a comparable basis. A case in point concerns the procedure used in the accounting of bottles, cans, and cases. Of even more seriousness was the inadequacy of the accounting systems used by a number of companies with respect to the periodic recognition of accrued items. The impossibility of segregating fluid milk costs from those applicable to the byproducts further limits the validity of these data.

NET PROFITS

Operating income is defined as the return to a business after deducting from gross income the cost of goods sold and operating expenses. Operating expenses in the milk distribution business are generally classified as processing or manufacturing, delivery, selling, and general administration. Net profit represents operating income adjusted for nonoperating income and expense, such as interest, rentals, gains or losses on the disposition of fixed assets, bond discount and expense, income taxes and the like. The latter is in a certain respect a more important measure of business activity than operating profit, because it measures the earning power of the business in all of its phases.

Net profits are indicated in relation to three items: Net sales, total capital employed, and net worth. (See table 39.) The ratio of net profits to net sales is the one by which business profitability is most commonly measured. The second ratio expresses the ratio of earnings on total capital employed, or in other words, the economic productivity of capital from the managerial point of view. As such it may be regarded as an indication of operating efficiency when the whole of the enterprise is considered. The ratio of net profits to net worth is commonly called the profits-worth ratio and differs from the above in that it measures the rate of earnings on the proprietary equity; it indicates the relative amount of income available for reinvestment or distribution.

TABLE 39.—Range in rates of net profits of milk distributors, 1928–34

Period ended	Num- of com- panies	Net profits or losses expressed as percentages of—								
		Net sales			Total capital employed ¹			Net worth ¹		
		High	Low	Average	High	Low	Average	High	Low	Average
		Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Dec. 31, 1928.....	3	1.76	² 2.96	² 0.45	11.32	² 4.86	² 1.31	25.22	² 12.21	² 3.64
Dec. 31, 1929.....	4	2.23	1.20	1.44	13.45	1.61	2.31	26.59	9.97	18.44
Dec. 31, 1930.....	4	3.88	² 4.99	3.13	12.83	² .98	8.75	27.42	² 2.20	25.60
Dec. 31, 1931.....	7	4.89	² 7.17	1.85	17.90	² 6.52	4.34	26.50	² 12.93	11.25
Dec. 31, 1932.....	13	8.64	² 57.79	2.48	14.85	² 41.83	2.76	27.85	³ 448.29	3.72
Dec. 31, 1933.....	16	9.17	² 11.25	² 1.64	24.07	² 55.35	² 1.67	51.49	² 44.62	² 2.27
Apr. 30, 1934.....	20	9.17	² 123.65	.10	10.58	² 62.31	.04	14.99	³ 434.54	.05

¹ Total as of the end of the period. This is not an entirely proper procedure from an accounting point of view, since profits (or losses) for the period are reflected in the denominator, i. e., gains are minimized and losses are exaggerated. Thus, a net profit of \$100 on a beginning-of-year investment of \$1,000 produces a rate of return of 10 percent. The same profit on investment at the end of that year (no change assumed in investment except that added by profits) is 100/1100, or 9.09 percent. Similarly, a net loss of \$100 is reflected as a reduction of 10 percent, and 11.11 percent, of the investment as of the beginning and end of the year, respectively.

² Losses incurred.

³ Losses on a debit balance of net worth.

Based upon audits of the distributors' books.

There are surprisingly large variations in the rates of return between companies for each of the several periods, particularly since 1932. While rather large net profits were earned by at least one company during each period, net losses were shown by at least one other company in every period except 1929. The average rate of profits declined between 1930 and 1933, yet the rate of return (as measured on

net sales) for the most profitable firm in each year shows a continuous increase.

The wide variation in the rates of return from milk distribution in Milwaukee indicates a high degree of efficiency on the one hand and considerable lack of efficiency on the other. Despite the relatively favorable showing made by certain companies with respect to their operating income, there is considerable evidence to support the contention that their relatively unfavorable position as indicated by net earnings was attributable to heavy, if not excessive, obligations arising from overcapitalization. It should not be inferred, however, that overcapitalization was peculiar of any class of companies, since a grouping of rates of return by size of concern does not reveal significant differences. Bad debt losses also appeared an important offset to profits in several cases.

It is of interest in this connection that the net deductions for nonoperating income and expense⁴⁰ of all companies ranged from .75 percent of net sales in 1928 to 2.66 percent in the 4-month period of 1934.

On the basis of rather incomplete data as to the disposition of profits earned, it would appear that with few exceptions the net profits earned by the several enterprises from 1930 through 1933 were largely retained in the businesses. The audits disclose payments of dividends on common stock but by two companies and on preferred stock by but one company during this period. Only one of the three companies, however, is shown to have made these payments regularly—those on preferred stock.

As stated heretofore, net profits are reflective of all activities of a business. Operating profits, on the other hand, indicate results of the principal functions of the enterprise. Before turning to a consideration of operating profits it is well to examine in some detail the expenses incurred in operation, that is, raw material and operating costs.

RAW MATERIAL COSTS

Raw material costs, while including those for miscellaneous products, such as chocolate sirup, etc., represent very largely the costs of milk and cream. Costs of materials are not shown in detail by products since the prices paid for milk and cream have been uniform between distributors subsequent to the control of prices by the State of Wisconsin. Consequently the variations in the proportion of net sales represented by raw material costs (table 40), especially in the last two periods, are largely attributable to variations between distributors in the relative volumes sold in different uses, which were presumably purchased at uniform class prices. The ratios as set forth in this table show that the proportion of net sales expended for raw materials declined from 62.6 percent in 1929 to 53.2 percent in 1932, rose slightly to 53.5 percent in 1933, and then dropped in the first 4 months of 1934 to 52.6 percent.

⁴⁰ Represents the difference between total nonoperating income and total nonoperating expense, which, for every year, involved a deduction from operating profits. Because of this compensation the importance of the nonoperating expenses is largely underemphasized.

TABLE 40.—*Raw material costs of distributors expressed as a percentage of net sales, 1928-34*

Year	Number of companies	Percentage							Average all companies
		45 and under	46-48	49-51	52-54	55-57	58-60	61 and over	
1928-----	3	-----	-----	-----	-----	1	-----	2	<i>Percent</i> 59.6
1929-----	4	-----	-----	-----	-----	-----	-----	4	62.6
1930-----	4	-----	-----	-----	-----	-----	4	-----	59.7
1931-----	7	-----	-----	-----	2	4	-----	1	60.7
1932-----	14	1	3	3	2	1	2	2	53.2
1933-----	16	1	1	2	6	2	4	-----	53.5
1934 ¹ -----	20	-----	-----	6	6	1	3	4	52.6

¹ January-April 1934.

Compiled from data contained in distributors' audits.

OPERATING EXPENSES

The accounting systems used by the majority of milk distributors are inadequate for expressing costs of individual products. While this situation in some cases can be traced to an avoidance of cost systems so as to preclude disclosure of data on specific products, it is apparent in other cases, particularly with the smaller firms, that the fluid milk, cream, and byproduct departments of the business are so closely interrelated as to make cost accounting both difficult and expensive. Cost data are available, however, as classified into processing, delivery, selling, and administrative expenses. Therefore this discussion on operating costs is limited to the expression of these items in relation to net sales and in units of milk purchased. Both methods are indicative of company averages but not of variations in costs between products of any one company on the conventional basis. The expression of operating costs in units of milk purchased is an entirely arbitrary procedure; and while unsatisfactory from an accounting viewpoint, particularly for delivery expenses where costs should be expressed in terms of products or "points" handled on the delivery routes, this method is used to give a basis for comparing with some degree of accuracy operating costs measured in monetary terms.

Insofar as it has been possible to do so, the operating expense classifications as used in this report include those costs which are properly chargeable to the several departments. Thus processing expense includes the plant costs of labor and overhead incurred in receiving, cooling, pasteurizing, bottle filling, bottle washing, etc., and, in the case of those companies producing byproducts, costs of manufacture, containers, and the like. Delivery expense includes principally the wages and commission paid to delivery personnel and vehicle costs. Several of the larger companies maintaining regular delivery departments include, in addition, office expense and plant costs chargeable to the delivery function. Similarly, the selling expense of the smaller companies includes only advertising and salary costs, while for others it includes office expense of the selling department and bad debt expense. Because of this difference in accounting procedure the selling and general and administrative expenses of the several companies must necessarily be compared in total only.

There are numerous factors that tend to be associated with wide variations in operating expenses between companies. The distributor who limits his activities to the pasteurization and bottling of milk and cream normally would be expected to have lower processing costs than one who, in addition, manufactures products such as condensed milk and dry skim milk. Similarly, distribution costs vary, partly because of differences in route characteristics and vehicles used and partly because of differences in type of sale. For instance, the company with the lowest delivery costs during 1932, 1933, and the 1934 period was one engaged principally in wholesale distribution. (See table 41.)

TABLE 41.—Range in operating costs of distributors expressed as percentages of net sales and per unit of receipts, 1928–34

Operating expense	Number of companies	Percentage of net sales			Per quart of receipts		
		High	Low	Average	High	Low	Average
<i>Processing</i>		<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Cents</i>	<i>Cent</i>	<i>Cents</i>
1928.....	3	18.85	11.27	16.83	1.85	1.19	1.69
1929.....	4	14.59	11.09	12.83	1.32	1.14	1.18
1930.....	4	16.55	10.38	15.25	1.98	.84	1.81
1931.....	7	17.10	11.43	12.68	1.71	.83	1.17
1932.....	14	51.87	12.05	14.51	3.79	.76	1.05
1933.....	16	17.56	10.77	14.48	1.55	.62	.98
1934 ²	20	33.85	8.87	13.48	2.21	.71	1.00
<i>Delivery</i>							
1928.....	3	19.19	13.00	17.53	1.86	1.47	1.76
1929.....	4	18.09	13.17	17.15	1.50	1.30	1.35
1930.....	4	20.65	15.05	16.02	2.03	1.23	1.90
1931.....	7	25.90	17.19	18.50	2.65	1.10	1.71
1932.....	14	48.17	16.10	24.65	4.57	.71	1.78
1933.....	16	36.04	11.62	26.06	2.92	.68	1.77
1934 ²	20	47.76	14.44	25.25	2.86	.74	1.86
<i>Selling</i>							
1928.....	3	2.33	.20	2.02	.26	.02	.20
1929.....	4	3.11	.27	1.74	1.31	1.07	1.14
1930.....	4	3.30	.39	1.68	.26	.03	.20
1931.....	7	4.25	.35	1.92	.30	.03	.18
1932.....	14	8.82	.40	2.14	.17	.00	.15
1933.....	16	13.84	.23	2.28	1.45	.01	.16
1934 ²	20	7.95	.25	2.31	.27	.02	.17
<i>Administration</i>							
1928.....	3	6.84	2.97	3.32	.66	.29	.33
1929.....	4	7.08	2.55	2.93	1.48	1.31	1.38
1930.....	4	7.51	2.41	2.71	.47	.30	.32
1931.....	7	9.84	2.21	2.83	.46	.21	.25
1932.....	14	21.56	2.14	2.98	1.58	.02	.22
1933.....	16	12.49	1.02	3.72	.83	.08	.25
1934 ²	20	18.26	.77	3.63	1.19	.18	.27
<i>Total⁴</i>							
1928.....	3	42.50	38.46	39.70	4.16	3.35	3.98
1929.....	4	35.34	31.66	34.65	3.15	2.99	3.05
1930.....	4	38.37	35.41	35.66	4.53	2.90	4.23
1931.....	7	45.99	34.44	35.93	4.92	2.69	3.31
1932.....	14	107.25	37.22	44.28	8.65	2.35	3.20
1933.....	16	52.91	38.41	46.54	4.97	1.83	3.16
1934 ²	20	99.87	37.39	44.67	6.51	1.89	3.30

¹ Based upon 3 companies only. 1 company is excluded because of inadequate data.

² First 4 months of 1934.

³ Includes selling expenses.

⁴ These figures for the high- and low-cost companies represent total operating costs and may differ from the sum of the costs by functions.

Based upon audits of the distributors' books.

Aside from these factors, it should be pointed out that in a number of cases the highest operating costs are of those companies which had only recently started distributing milk. In other words, it is probable

that those firms had not been in operation long enough to adjust their operating costs to a profitable basis.⁴¹

Operating costs represented a smaller proportion of the distributors' sales dollar in 1929 than in any of the other periods under consideration; they amounted to 34.7 percent of net sales in that year as compared with 46.5 percent in 1933 and 44.7 percent during the 4-month period of 1934. On a cents-per-quart basis the trend of total operating costs was downward subsequent to 1929. Because net sales declined at a faster rate, due in part to decreases in prices, the proportion of net sales represented by operating costs increased during this period.

It is rather significant to note that the average processing costs expressed in cents per quart of receipts declined appreciably between 1930 and 1934. Average delivery costs, on the other hand, show no significant changes. This would indicate that plant costs were reduced during the depression, while delivery costs tended to remain more or less fixed. Consideration of delivery costs in terms of products delivered on the routes, rather than in terms of receipts (which increased during the period as pointed out above), substantiates this statement.

Further examination of the operating expenses of the several companies reveals a marked increase in expenditures for advertising, which was probably due to intensified competition in the market during the depression period. This is particularly noticeable of those participants attempting to establish themselves in the market. Administrative costs, on the other hand, were reduced considerably by several of the larger companies in the market.

IMPORTANCE OF LABOR COSTS

Wages and salaries constitute the largest items of both processing and delivery expense. Thus, the earnings of plant employees in the Milwaukee firms averaged about two-fifths of the total processing costs during 1932, 1933, and the first 4 months of 1934. Labor costs represented a higher proportion of total delivery expense, aggregating almost three-fourths of the total amount involved in this part of the distributing operations (table 42). Expressed as a percentage of net sales, plant labor and delivery labor averaged 5.7 percent and 18.6 percent, respectively, during these periods.

TABLE 42.—*Percentage of processing and delivery costs represented by wages and salaries, by specified distributor groups, 1932-34*

Company classification	Processing labor as a percentage of processing cost			Delivery labor as a percentage of delivery cost		
	1932	1933	1934 (4 months) ¹	1932	1933	1934 (4 months) ¹
Old companies:						
Gained.....	Percent 56.9	Percent 43.5	Percent 42.5	Percent 73.4	Percent 70.5	Percent 71.1
Lost.....	41.8	39.6	42.6	72.6	73.1	75.0
New companies.....	28.3	34.0	36.5	71.5	71.4	71.4
Others.....			49.5			75.5
Average all companies.....	42.3	39.5	42.1	72.6	72.6	74.1

¹ January-April 1934.

Based upon audits of the distributors' books.

⁴¹ Part period figures of companies were expanded to a full period basis for purposes of comparison.

The relationship between labor and total costs of delivery referred to above shows a marked constancy not only between the groups ⁴² of companies but for each of the years considered, notwithstanding changes in the total amount paid out in wages during these years. This indicates a peculiarity of delivery costs; that is, as the number (and wage bill) of routes is decreased other delivery costs follow proportionately.

This condition is not observed in the case of plant costs, however. Plant overhead tends to remain more or less constant regardless of the number of people employed or the percentage of plant capacity utilized. Expenditures for labor were less in 1933 and 1934 (if 4 months may be presumed to be indicative of the whole year) than they were in 1932 in the case of those old companies which lost business as well as those old companies which gained business; the proportion of their total operating expenses, represented by labor, was likewise less.

Based upon group averages, the "other" companies had the highest unit cost for plant labor, but this condition seems to have been the result of limited receipts per man rather than higher wages. In fact the monthly wages paid plant labor by this group amounted to only \$75.32, compared with \$97.93 paid by the "new" companies and \$120.03 and \$91.21 paid by the old companies which lost and gained business, respectively. (See table 43.)

TABLE 43.—Average monthly wages paid by specified groups of distributors, April 1934

Type of labor	Old companies		New companies	Others	Average all companies
	Gained	Lost			
Employees:					
Processing.....	\$91. 21	\$120. 03	\$97. 93	\$75. 32	\$112. 15
Delivery.....	122. 73	135. 64	121. 62	86. 50	130. 25
Selling.....	123. 57	148. 57	96. 19	85. 00	135. 98
Administrative.....	111. 00	96. 24	95. 31	76. 67	97. 08
Average.....	113. 40	128. 32	114. 30	82. 51	122. 88
Managers:					
Processing.....		297. 50	141. 67		204. 00
Delivery.....				75. 00	75. 00
Selling.....	235. 40	256. 67	175. 00		243. 80
Administrative.....	308. 60	459. 38	136. 67	116. 67	352. 57
Average.....	301. 95	423. 56	140. 00	106. 25	327. 02
Employees and managers:					
Processing.....	91. 21	121. 05	100. 01	75. 32	113. 09
Delivery.....	122. 73	135. 64	121. 62	86. 26	130. 21
Selling.....	160. 85	169. 49	107. 45	85. 00	156. 52
Administrative.....	176. 87	173. 27	108. 04	90. 00	160. 16
Average.....	123. 04	137. 15	115. 42	83. 73	130. 24

Computed from data contained in audits of the distributors' books.

The situation with respect to delivery labor was somewhat different. Here the company group paying the lowest wages had the lowest per unit delivery labor costs, and the group paying the highest wages had the highest per unit delivery costs.

⁴² The ranges in the proportion of operating expense represented by labor costs are not depicted by individual companies due to the difficulty in properly allocating labor costs between the several departments, particularly in the case of the smaller firms.

Twenty-one of the 25 companies in the market employed a total of 2,056 individuals during April 1934. Of this number 1,982 were classified as employees and 74 as managers (salaried supervisors, officials, proprietors, etc., but excluding the officials of several companies.) These individuals were grouped according to functions as follows: Processing 488, delivery 1,283, selling 42, and the remainder, or 243, in administration. Not all of this personnel can be said to have been engaged in the fluid-milk business, however, since these figures include an undetermined number of employees and managers of byproduct plants.

The total pay roll of the 21 companies amounted to \$267,253.12 for the month of April 1934. It is presumed that the pay roll, as well as the number of employees of the four plants excluded from consideration, amounted to but a very small percentage of the total of the 21 companies as indicated.

INCOME FROM OPERATIONS

Table 44 shows that in general the rate of operating profits accruing to milk distributors in Milwaukee declined appreciably from 1930 through 1933. Undoubtedly, a majority of the distributors were unable to cut their costs in accordance with the deflationary price movements of the depression. However, the depression apparently had but little effect upon some operators; the unit-operating profits of certain companies during 1933 and 1934 were found to be substantially above comparable returns in earlier years.

TABLE 44.—Range in income from operations of distributors expressed as percentages of net sales and per unit of receipts, 1928-34

Year	Number of companies	Proportion of net sales			Per quart of receipts		
		High	Low	Average	High	Low	Average
		<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
1928.....	3	3.48	1 1.36	0.73	0.395	1 0.134	0.077
1929.....	4	3.58	.30	2.73	1.429	1 0.027	1.240
1930.....	4	5.58	1 6.5	4.61	.616	1.145	.546
1931.....	7	6.28	1 3.60	3.34	.757	1.141	.308
1932.....	14	11.50	1 56.37	3.23	.904	1 5.353	.232
1933.....	16	9.39	1 4.70	1.04	.890	1.273	1.003
1934 ³	20	9.36	1 60.83	2.76	.903	1 3.666	.208

¹ Operating loss incurred.

² Based upon 3 companies only; 1 company is excluded because of inadequate data.

³ First 4 months.

As determined from audits of distributors' books.

INCOME STATEMENTS OF SIX SELECTED COMPANIES

Mention is made above to the effect that labor costs represent the most important item of both processing and delivery expenses. In order to give some indication of other costs, detailed income statements for 1933 of two large firms, two medium-sized firms, and two small firms are given in table 45. The consideration of selected large, medium, and small companies facilitates comparison of costs between firms as associated with size.

TABLE 45.—*Profit and loss statements of 6 selected distributors, 1933*

Expense	2 large com- panies		2 intermediate companies		2 small com- panies		Average 6 com- panies	
	Per- centage of net sales	Per quart of re- ceipts	Per- centage of net sales	Per quart of re- ceipts	Per- centage of net sales	Per quart of re- ceipts	Per- centage of net sales	Per quart of re- ceipts
	Per- cent	Cents	Per- cent	Cents	Per- cent	Cents	Per- cent	Cents
Total net sales.....	100.00	6.939	100.00	5.785	100.00	7.899	100.00	6.850
Cost of products sold.....	53.30	3.699	54.82	3.171	51.09	4.035	53.39	3.657
Gross spread.....	46.70	3.240	45.18	2.614	48.91	3.864	46.61	3.193
Processing expense:								
Labor.....	5.90	.409	7.92	.456	7.22	.570	6.06	.415
Power and refrigeration.....	2.56	.177	1.63	.094	2.23	.176	2.49	.170
Repairs.....	.75	.052	.68	.040	1.29	.102	.75	.051
Depreciation.....	1.03	.071	1.60	.092	1.54	.122	1.07	.073
Taxes and rent.....	.39	.027	.43	.025	1.38	.109	.40	.028
Insurance.....	.12	.009	.42	.025	.11	.009	.14	.011
Auto expense.....	.26	.019	.....	.....	.....	.....	.24	.016
Cartons, boxes, barrels, etc.....	2.35	.163	.41	.024	.59	.046	2.20	.151
Bottle caps, wire, etc.....	.42	.029	.31	.019	.38	.030	.41	.028
Bottles.....	.31	.021	.57	.033	.46	.036	.33	.023
Supplies.....	.48	.033	.72	.042	.91	.072	.50	.034
Miscellaneous.....	.18	.014	.45	.026	.43	.034	.21	.014
Total.....	14.75	1.024	15.14	.876	16.54	1.306	14.80	1.014
Delivery expense:								
Salaries, wages, and commis- sions.....	19.73	1.369	16.93	.979	14.29	1.129	19.48	1.335
Feed and bedding.....	.66	.046	.67	.040	.....	.....	.65	.045
Horse shoeing.....	.37	.026	.37	.021	.....	.....	.37	.025
Gas, oil, tires, and tubes.....	.62	.043	1.46	.084	5.10	.403	.72	.049
Repairs.....	1.25	.087	1.14	.066	2.42	.191	1.26	.086
Depreciation.....	1.67	.116	1.41	.081	1.34	.106	1.64	.113
Lights, power, refrigeration, and water.....	.22	.015	.....	.....	.....	.....	.21	.014
Freight, cartage, and express.....	.56	.039	.....	.....	.....	.....	.52	.035
Breakage and waste.....	.35	.024	.....	.....	.....	.....	.32	.022
Taxes and rent.....	.52	.036	.09	.005	.46	.036	.49	.033
Office expense and stationery.....	.15	.010	.....	.....	.....	.....	.14	.010
Insurance.....	.48	.033	.61	.035	.31	.024	.48	.033
Licenses.....	.06	.004	.06	.004	.26	.021	.06	.004
Miscellaneous.....	.39	.027	.05	.003	.....	.....	.36	.025
Total.....	27.03	1.875	22.79	1.318	24.18	1.910	26.70	1.829
Selling expense:								
Salaries and commissions.....	1.06	.074	.42	.024	.....	.....	1.01	.069
Telephone and telegraph.....	.07	.005	.....	.....	.....	.....	.06	.004
Stationery, printing, and postage.....	.13	.009	.....	.....	.....	.....	.12	.008
Auto expense.....	.09	.006	.....	.....	.....	.....	.08	.005
Advertising.....	.94	.065	1.06	.062	.34	.027	.94	.064
Credit and collections.....	.17	.012	.....	.....	.....	.....	.16	.011
Subscriptions and dues.....	.02	.002	.....	.....	.....	.....	.02	.002
Miscellaneous.....	.03	.001	.....	.....	.....	.....	.03	.002
Total.....	2.51	.174	1.48	.086	.34	.027	2.42	.165
General and administrative ex- pense:								
Salaries.....	2.16	.150	4.59	.265	3.27	.258	2.34	.160
Telephone and telegraph.....	.04	.003	.10	.006	.25	.020	.05	.003
Stationery, printing, and postage.....	.11	.008	.31	.018	.33	.026	.13	.009
Traveling expense.....	.02	.001	(¹)	(²)	.....	.....	.02	.001
Auto expense.....	.02	.001	.....	.....	.....	.....	.02	.001
Professional services.....	.15	.010	.05	.003	.....	.....	.14	.010
Subscriptions and dues.....	.01	.001	.....	.....	.....	.....	.01	.001
Taxes and rent.....	.04	.003	.....	.....	.11	.009	.04	.003
Light and heat.....	.01	.001	.....	.....	.....	.....	.01	.001
Depreciation.....	.08	.005	.05	.003	.02	.002	.07	.005
Miscellaneous.....	.46	.032	.46	.027	.24	.019	.45	.031
Total.....	3.10	.215	5.56	.322	4.22	.334	3.28	.225
Total operating expense.....	47.39	3.288	44.97	2.602	45.28	3.577	47.20	3.233
Income from operation.....	3.69	3.048	.21	.012	3.63	.287	3.59	3.040
Other charges and income, net.....	³ 1.77	³ 1.23	³ .84	³ .049	1.26	1.100	³ 1.68	³ 1.115
Net income or loss.....	³ 2.46	³ 1.71	³ .63	³ .037	4.89	.387	³ 2.27	³ 1.55

¹ Less than 0.01 percent of net sales.² Less than 0.001 cent per quart of receipts.³ Losses incurred.

Based upon audits of the distributors' books.

Power and refrigeration constituted the second largest item of processing expense for each of the three selected company groups. Depreciation charges ranked third in size for both the intermediate and small firms. The expenses of containers (boxes, cartons, etc.) however, far exceeded the depreciation expense of the large companies.

Unit expenses of delivery, based upon receipts in quarts, were highest for the small firms and lowest for the medium-sized firms. In terms of milk and cream sales this position is reversed, with delivery costs per quart of milk and cream sold amounting to 3.203 cents for the large firms, 2.179 cents for the intermediate firms, and 2.171 cents for the small firms. The differences in the relative positions of the three company groups are partly accounted for by the differences in their proportion of receipts sold as milk and cream. On a relative basis, the lowest delivery costs are shown for the intermediate companies.

The small companies are shown to have made the highest net profits, part of which originated from operations and part from income received from nonoperating sources. The large companies, on the other hand, incurred losses from operations which were augmented by relatively large nonoperating expenses. The operating profits of the intermediate companies were likewise reduced by nonoperating losses.

III

EFFECTIVENESS IN OPERATION OF EXISTING MARKETING STRUCTURE

In the preceding section the several firms engaged in the distribution of milk in Milwaukee are distinguished with respect to their differences in type of business, variations in sales, plant investment and capacity, profitableness, and other characteristics. With this information in mind, the emphasis is shifted in this section to an analysis of the effectiveness in operation of the existing market structure.

ASSEMBLY

SOURCE OF DATA

Questionnaires were submitted to each of the 174 haulers who delivered whole milk from producers to distributors. From this number, 169 reports were obtained covering certain details of operation during September 1934.

The results of this survey indicate that 3,035 shippers were served by the 169 haulers during the month of September 1934, or an average of approximately 18 shippers for each hauler. It was pointed out in an earlier part of this report that by actual count there were 3,848 producers serving the fluid market. The differences between these totals can be reconciled since the survey did not include: nearby producers who delivered directly to the distributors' stations, about 300 patrons of a country ice-cream plant of one of the distributors, and shippers of 5 of the 174 haulers who failed to submit reports. In addition to the above, the two totals are for different periods of the year and, therefore, are not entirely comparable.

MILES TRAVELED

The 169 truckers from whom reports were received collected 96,105 gallons of milk daily. This is equivalent to an average of 568.7 gallons a day for each hauler, and 31.7 gallons for each shipper. In the collection of this milk the trucks traveled 9,786 miles daily, of which 732 miles were traveled from the haulers' homes to the first shippers, 2,594 miles on the routes proper, i. e., the total distance between the first and last shipper on each route, and 2,679 miles were traveled to deliver the milk from the last shipper on each route to the plants. The balance of the 9,786 miles traveled daily represented the return trips of the trucks to the homes of the truckers.

Of the total mileage covered daily, 6,239 miles were on paved highways, 3,182 miles on graveled roads, and 365 miles on unimproved roads. On the average, each truck was operated over a route of about 58 miles daily.

CONCENTRATION OF SHIPPERS

The relative density of shippers on the hauling route is one of the important factors in determining the length of the route, the cost of hauling per unit, and the like. In a limited time, truckers are able to accommodate only a relatively small number of patrons as the distance between farms increases. This inverse relationship between density of shippers and the number of shippers on each route is shown in table 46. The largest number of routes (59) and the largest number of shippers (1,241) fall in the interval of 0.50 to 0.99 mile. This interval includes the average distance between shippers for the entire group, 0.85 mile.

TABLE 46.—*Concentration of milk shippers on routes proper, September 1934*

Number of miles between shippers on routes proper	Number of routes	Total number of shippers	Shippers per route
Under 0.50.....	29	639	22.0
0.50-0.99.....	59	1,241	21.0
1.00-1.49.....	33	530	16.1
1.50-1.99.....	17	226	13.3
2.00-2.49.....	8	94	11.8
2.50-2.99.....	6	54	9.0
3 and over.....	6	45	7.5
Total.....	158	2,829	17.9
No reports.....	11	206	18.7
Grand total.....	169	3,035	18.0

Compiled from questionnaires submitted by milk haulers, September 1934.

The relationship between the location of shippers and the size of shipments could not be directly measured from data included in the truckers' survey. However, a frequency classification of shippers according to the distance between the last shipper on each route and the plant indicates that there is a marked tendency for average shipments to increase as the distance of farms from the market increases. (See fig. 12.) With the exception of the 15-19.9 mile classification, every increase in distance was accompanied by higher average shipments. The average shipments of each shipper on routes over 30 miles between the last shipper and plant were more than double the average shipments on routes where this distance was less than 5 miles, the amounts being 51 gallons and 25 gallons, respectively.

HAULING TIME

An aggregate of 937.2 hours was required daily to complete the 169 routes, or an average of 5.5 hours per route.

Considerably more than half of the number of routes were between 35 and 64.9 miles in length. With the exception of those routes under 20 miles in length, the average time required for each shipper shows a tendency to increase directly with the length of the route. (See table 47.)

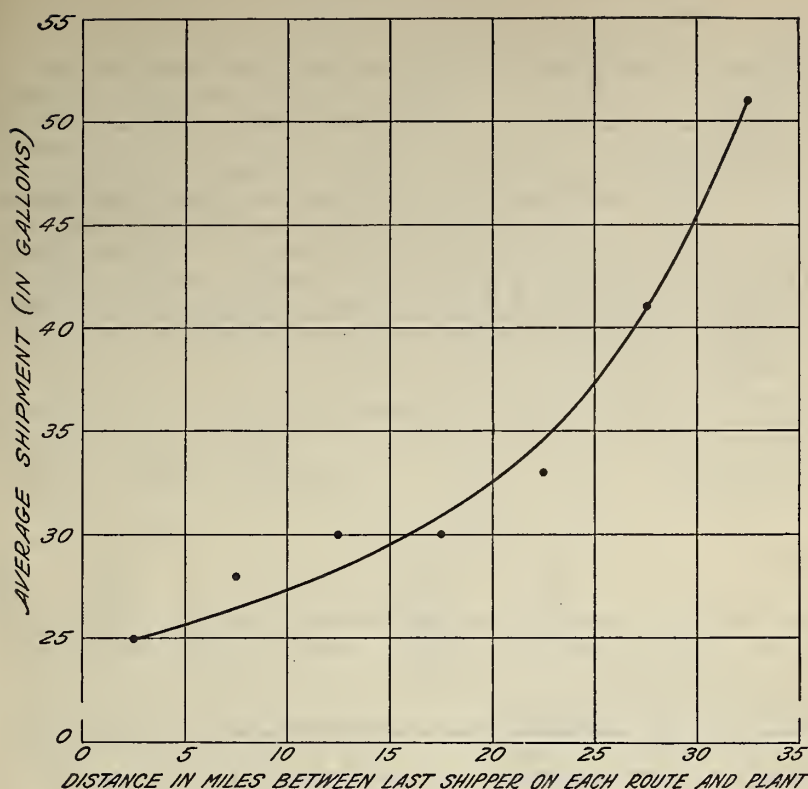


FIGURE 12.—Relationship between distance from the market and size of average milk shipments, September 1934.

TABLE 47.—Miles per hauling route in relation to average time per shipper, September 1934

Miles per route	Number of routes	Hours spent on route	Number of shippers	Average minutes per shipper
Under 20.....	6	14.5	46	18.9
20-34.9.....	16	54.2	363	9.0
35-49.9.....	42	215.0	919	14.3
50-64.9.....	46	279.5	853	19.7
65-79.9.....	20	124.5	303	24.7
80-94.9.....	16	96.5	189	30.6
95-109.9.....	17	118.0	242	29.3
110 and over.....	3	24.0	39	36.9
Total.....	166	926.2	2,954	18.8
No reports.....	3	11.0	81	8.1
Grand total.....	169	937.2	3,035	18.5

Compiled from questionnaires submitted by milk haulers, September 1934.

HAULING RATES

A logical rate structure for milk hauling is one which is based primarily upon the length of the haul, and is supplemented by charges for services rendered and adjustments for quantity. With few exceptions,⁴³ it was impossible to ascertain from the truckers' questionnaires

⁴³ 1 Milwaukee company which has its own fleet of trucks charged rates which were graduated according to distance; adjustments were made for service and quantity.

to what extent the rates charged in the Milwaukee market (September 1934) were established in recognition of the above factors.⁴⁴

The results show that the hauling charges varied from 6 to 32 cents per hundred pounds, with a weighted average rate of 18.6 cents. Mortenson found that the most common charge in 1930 was 23 cents per hundredweight. There is a general tendency for the rates to increase as the average distance a gallon is hauled increases. (See table 48.) The most significant exception occurs with those rates under 15 cents; the average mileage for these rates (6 in number) was about the same as that for rates from 20 to 22 cents. This discrepancy is largely accounted for by the fact that two large loads, 1,280 and 1,730 gallons, were shipped 30 and 37 miles, respectively, by rail after removing the tanks from the trucks. These two loads tended to make the average distance high relative to the rate.

TABLE 48.—Comparison of milk-hauling charges with length of haul, September 1934

Hauling rate in cents per hundredweight	Volume handled ¹	Average distance ²	Hauling rate in cents per hundredweight	Volume handled ¹	Average distance ²
	<i>Gallons</i>	<i>Miles</i>		<i>Gallons</i>	<i>Miles</i>
14 and under.....	7,410	28.12	22.....	2,902	28.88
15.....	6,811	19.73	23.....	3,110	37.10
16.....	7,320	20.08	24.....	504	36.00
17.....	7,646	23.12	25.....	1,208	45.30
18.....	30,248	20.36	26 and over.....	3,418	42.09
19.....	4,005	24.99			
20.....	18,891	28.80	Total.....	95,567	25.15
21.....	2,194	28.88			

¹ No records were obtained for 538 gallons.

² Derived by adding $\frac{1}{2}$ the mileage of the route proper to the mileage between the last shipper and the plant, weighted by the number of gallons.

Compiled from questionnaires submitted by milk haulers, September 1934.

The largest number of gallons (30,248) was hauled at the rate of 18 cents per hundred pounds and the second largest number of gallons (18,891) at 20 cents. These two shipments represented about 50 percent of the total volume of milk.

CAPACITY OF TRUCKS USED

The aggregate capacity of the 169 trucks was reported as 19,096 cans. On the basis of daily collections of 11,874 cans, the trucks during September 1934, a month of relatively low production, were loaded to about 62 percent of capacity. Notwithstanding an increase in the number of trucks from previous years (from 134 in 1930⁴⁵), the percent of capacity utilized was found to be almost identical with that reported by Mortenson during the season of low milk production in 1928.

Considering the volume handled and the rates charged, the trucks earned a gross amount of \$1,482.89 daily, or an average of \$8.77 per truck. Assuming the same conditions to have prevailed throughout a 30-day month, average gross earnings per truck would have been \$263.10 for the month in which the study was made.

⁴⁴ This confusion arises from faulty wording in the questionnaire. The only question relative to the rate structure, rates per 100 pounds of milk hauled to distribution plant, was answered in most cases with one figure. Under these circumstances, it was difficult to determine whether the rate, as given, represented a uniform rate over the entire route or merely the average rate charged.

⁴⁵ Mortenson, op. cit., p. 8.

ROUTE DUPLICATION

An analysis of completed questionnaires submitted by 143 haulers indirectly suggests the amount of route duplication. In the collection of milk over the routes these 143 haulers stopped at 2,597 farms. However, because of the scattering of farms on the routes, these same haulers passed a total of 2,852 other farms. In other words, 1.1 farms were passed, on an average, for each one visited. Several truckers reported passing no farms on their routes proper. On the other extreme, 1 trucker in contacting 9 farms passed up 55 others.

It is difficult to draw any hard and fast conclusions relative to efficiency in unloading operations. Of the aggregate time of 937.2 hours required daily by the 169 truckers to complete their duties, approximately 195 hours were spent in waiting at the plants. On the basis of an average time of 5.5 hours required by each hauler to complete his route, roughly 65 minutes were spent at the unloading platform, only a small part of which probably was required in the actual unloading operations.

DAIRY PLANTS

MEASURES OF EFFICIENCY

There are several adaptable methods of measuring the factors affecting the efficiency of operation of milk plants, perhaps the most satisfactory of which involves the utilization of physical input-output ratios. Relating output to the several physical inputs, units of power, labor, etc., necessary for the production process expresses the results of plant utilization in terms which are unaffected by changes in money costs over short periods of time, and which eliminate the differences in costs of input such as wages and the like, thus making possible more direct comparisons between firms. These ratios are of significance in a comparison of plants, provided that the instruments of production and the plans of organization are identical or at least very similar. Otherwise, variations between plants may be due entirely to the differences in the equipment used and the commodities produced.

The most commonly used method of measuring plant efficiency is that employed in commercial practice, namely, cost accounting. In some respects this is perhaps the most tangible method since unit profits, the objective of all competitive business, tend to vary inversely with plant and related costs. There are, of course, admitted weaknesses. In the first place, the results, unless adjusted, will tend to vary between years due to changes in the price levels. In the second place, since cost accounting is largely an adaptation of arbitrary allocation of expense, lack of standardization in the cost systems used by the companies in question will be associated with wide variations in results which may be unrelated to plant efficiency.

Considerable elaboration of costs of operation and, in turn, operating profits of the several milk distributors operating in Milwaukee in 1934 has been given in a previous section. With these details in mind, it is necessary only to reiterate that: The differences in plant costs observed between the several company groups may be due to some extent to differences in functions performed rather than to

differences in the efficiency of operation; allocations of cost are given only on a departmental and not on a product basis; and a part of the variation in unit costs between the several company groups is attributable to differences in the costs of the various inputs.

FACTORS AFFECTING EFFICIENCY IN PLANT OPERATIONS

Any attempt to depict the physical factors influencing internal plant efficiency of the existing distributors must necessarily be more descriptive than analytical. Due to the extreme variability between plants and in the nature of their enterprises, it is difficult to establish any standard, even hypothetically, which would serve as a criterion by which the individual plants might be judged. Furthermore, the data available to this survey in this connection were largely restricted to the plant appraisals⁴⁶ and such related data as could be utilized from the audits. In other words, the effectiveness of operation, as measured by output per unit of input, could not be ascertained. As a result, the material in this section is limited largely to a description of the outstanding characteristics of individual plants, or groups of plants, when generalizations are permissible.

On the whole, the dairy plants of Milwaukee in 1934 were probably typical of those existing in other large cities. There were a few plants where arrangements and maintenance were considered by the appraisers to be outstanding from an engineering point of view. The greater number, however, failed to fall into this category and their positions were attributed to numerous causes, many of which were applicable to more than one plant. In none of the plants was the equipment found to be strictly modern, although a few had relatively new equipment and their older equipment was maintained in such good repair that it was still operating quite efficiently.⁴⁷ The important point is, however, that the straight line principle of layout was not adhered to strictly in any of the plants.

The location of milk plants, while most important perhaps with respect to the costs of delivery, nevertheless has some influence upon other operating costs. Unfortunately, the significance of location could not be precisely measured. The majority of the distributors in Milwaukee were located within a 4-mile radius of the center of the city. Those distributors located in the residential or semiresidential areas, while having relatively favorable real-estate costs, were handicapped principally because of the scattered location of their customers in relation to their plants. On the other hand, those located in the commercial zones, particularly those closer to the business center of the city, probably were burdened with relatively high taxes, high land costs, crowded traffic conditions, and the like.

One of the major faults found with the existing plants was the overcrowding of equipment within limited quarters.⁴⁸ While it may have been entirely possible that originally the structures of these particular companies may have been adequate to house all the necessary equipment, several of the companies, because of their increased

⁴⁶ Detailed appraisals were not made of those buildings which were used but not owned by the dairies. In addition, 2 plants owned by the respective operators were not covered by detailed appraisals due to the fact that extensive alterations were being made at the time of appraisal.

⁴⁷ The depreciation of factory equipment, as measured by the difference between reproductive and sound values as of Apr. 30, 1934, amounted to 35.1 percent for the 22 companies whose equipment was appraised. Seven of the 22 companies had a depreciation of less than 20 percent and only 2 had a depreciation in excess of 40 percent.

⁴⁸ As indicated by the appraisals, only 5 of the city plants had good plant arrangement.

sales, had installed additional processing facilities in buildings which had not been designed to accommodate the additions. Presumably, the distributors in deciding whether to crowd equipment or expand the plant, balanced the probable increase in costs due to crowding and the resulting poor organization of equipment against the probable costs of expansion of building facilities.

The factors contributing to this situation are not difficult to find. Approximately half of the distributors in the market were lessees of buildings which their plants occupied; some of the others were operating in structures purchased from defunct dairies and other interests, leaving comparatively few which had built their plants to specifically meet anticipated requirements.

Reports of the appraisers indicate that the majority of buildings were of fireproof construction and principally of concrete and brick. However, there were instances where ordinary dwellings of frame construction had been used as supplementary buildings in housing the dairy plants. As regards conditions of buildings, in the opinion of the appraisers only a small number of the structures were described as being in good repair; the rest ranged from a poor to a fair condition.⁴⁹

The condition and adequacy of buildings often inversely affect costs, due principally to the loss of efficiency in operations brought about by overcrowding and poor layout. Furthermore, it is not uncommon that poor and inadequate buildings contribute to unsanitary conditions in the plants, which, in turn, may affect the quality of products. For the most part, the plants were said to have been kept in a clean and sanitary condition. In a few plants, however, it was evident that commodities were handled carelessly.

In most cases, the best combination of factors of production in milk distribution, as in other lines of business, can be ascertained only after considerable manipulation and experimentation; even then the costs of one or more of the input factors may have changed sufficiently to distort what was previously the most advantageous combination. Nor can all of the factors be readily controlled; changes in equipment and operating methods often are not feasible to correct maladjustments of a short-run nature. Neither is it a matter of sound policy to discharge or hire labor when it is more or less apparent that the situation is only temporarily abnormal. In addition, once a plant is built, competitive forces may make it difficult to secure the volume that would be associated with the lowest possible costs of operation.

Aside from purely internal factors affecting plant utilization, numerous circumstances more or less beyond the control of individual plant managements exert a decided influence upon operations. Environmental factors in the area may be such as to seriously limit the general efficiency of the units in the aggregate, notwithstanding a high degree of efficiency manifested by a part of the individual firms. Thus, the capital investment of some of the plants may be of such size as to warrant reasonable returns on that investment. For the market as a whole, however, the total investment may be considerably in excess of normal requirements, with the result that costs are high because of an excessive capitalization.

⁴⁹ As measured by the difference between reproductive and sound values of the buildings of 12 companies for which data are available, it would appear that, on the average, less than one-fourth (22.1 percent) of the serviceable life of the buildings had expired. In fact, depreciation on buildings of 9 of the 12 companies was less than 30 percent, and only 1 firm had a depreciation of over 50 percent.

Another factor of special importance with respect to milk plants is the seasonality in the volumes handled. There is the problem of market surplus, arising from the common practice of distributors accepting all the deliveries of their patrons over the course of a year. This means that operations during the months of peak production come closer to utilizing capacity than operations in those months when production is lowest. The effects of seasonal variations in volumes could be minimized to a considerable extent were it not for the fact that sales also vary due to changes in consumption in different seasons and in the number of customers served.⁵⁰ Operations under such conditions necessitate numerous adjustments in the production process.

CHARACTERISTICS OF MILWAUKEE MILK PLANTS

In table 49 are shown such characteristics of plants as could be ascertained from available data. The sound value of the plant equipment is presumed to offer evidence of plant size. These factors cannot be accepted as conclusive measures of plant efficiency since there are no norms for comparison; their usefulness is limited, then, to a depiction of the variations between plants and an indication of the excessive capacity for the market as a whole.

An inspection of the volumes handled daily by plant employees during April 1934 discloses that the medium-sized plants utilized their labor to a much fuller extent than did the small plants. Thus the average volume handled daily per man in the small plants was found to be only 484 quarts a day in contrast with 984 quarts a day per plant employee in those plants having a sound value of plant equipment from \$20,001 to \$50,000. This difference is largely affected by specialization of labor which is possible only in the larger plants; where the employees must necessarily be shifted from one function to another, output per man is reduced. However, the advantages from specialization are often reduced, and sometimes even offset by the increased number and costs of personnel necessary for supervision and inspection. Whether the smaller volume of 831 quarts in the large plants was attributable to overspecialization could not be ascertained from data available to this survey. Marked variations between plants falling within the same size group also were noted.

Clement et al.⁵¹ found that the average volume of milk and cream handled daily per man in 92 plants varied from 816 quarts to 1,068 quarts. While these figures cannot be compared directly with those included in table 49, since cream receipts are not taken into consideration in this study, it would appear that the average volumes handled per plant employee in Milwaukee were relatively low during April 1934.⁵² Certainly the range in the volumes handled per plant employee is much greater between the Milwaukee plants than between the 92 plants studied in 1929.

⁵⁰ It is shown in a preceding section that the maximum variation in wholesale and retail sales of milk and cream in the market as a whole (based upon 15 companies) was 14.1 percent during 1933. Yet 12 of the 15 companies had a variation of over 20 percent, with 1 company showing a variation of over 201 percent. The effects of such extreme variations upon operating efficiency are not difficult to visualize.

⁵¹ Clement, C. E., LeFevre, F. E., Vain, J. B., and Grant, F. M. Effect of Milk-Plant Arrangement and Methods of Operation on Labor Requirements, U. S. Department of Agriculture Tech. Bul. No. 153, table 18, p. 36. December 1929.

⁵² As indicated by the health department records, farm-separated cream was purchased by but 2 large companies during the month in question. Consideration of cream receipts would thus increase the output per man only for the companies in the "\$50,001 and over" classification.

TABLE 49.—Plant characteristics of 22 distributors classified according to size of plant, April 1934

Characteristic	Size of plant (sound value of factory equipment in dollars)												
	10,000 and under			10,001 to 20,000			20,001 to 50,000			50,001 and over 1			All plants
	High	Low	Average	High	Low	Average	High	Low	Average	High	Low	Average	Average
Receipts of milk daily (quarts)-----	2,487	310	1,532	8,404	1,151	4,764	19,933	3,924	12,196	(1)	(1)	77,479	18,792
Percent bottled-----	100.0	58.9	75.3	91.0	56.7	72.0	77.0	50.7	59.7	86.6	58.6	63.7	64.0
Average number of plant employees-----	5	2	3.1	7	2	5.0	15	6	12.4	(1)	(1)	93.2	22.2
Receipts per employee (quarts)-----	764	174	484	1,410	192	953	1,329	654	984	950	747	831	845
Milk and cream sales per employee (quarts)-----	571	155	364	1,056	174	686	883	457	587	823	438	529	541
Hours required daily:													
Pasteurization-----	2.4	0.7	1.6	5.4	0.6	2.2	6.3	1.3	2.7	4.6	1.3	3.3	3.0
Bottle filling-----	1.8	0.4	1.0	3.5	0.6	1.2	2.5	0.7	1.6	5.7	2.7	3.2	2.4
Bottle washing-----	1.2	0.3	0.9	2.3	0.6	1.2	2.5	0.7	1.9	5.7	2.3	4.0	2.7
Percent of capacity utilized: ²													
Pasteurization-----	45.5	12.8	30.6	102.1	10.8	40.8	117.9	23.6	51.1	87.4	25.1	61.5	55.7
Bottle filling-----	33.2	7.0	17.9	65.7	11.3	23.4	47.9	14.0	29.6	107.2	30.8	51.1	44.7
Bottle washing-----	23.2	4.9	16.2	32.1	11.7	23.4	47.9	14.0	36.4	107.2	44.0	76.0	51.7
Floor space (square feet) ³													
Total-----			4,777	2,442	1,813	2,123	15,314	9,522	11,650	(1)	(1)	64,284	24,448
Per employee-----			4,388	611	302	426	1,587	857	951	968	442	543	588
Per quart of average daily receipts-----			4.2.5	0.8	0.3	0.5	2.4	0.7	0.9	1.0	0.6	0.7	0.7
Per quart of average daily milk and cream sales-----			4.2.5	0.9	0.4	0.6	3.1	1.2	1.4	1.2	1.0	1.0	1.1

¹ Ranges omitted in order not to disclose characteristics of firms easily identified.² Based upon the assumption that operations over a period of 5.5 hours daily constitute full utilization, i. e., 100 percent of capacity.³ Includes data for 10 companies only which handled approximately 83 percent of all receipts of Grades A and B milk in the market during April 1934.⁴ Based on 1 company only.

Based upon plant appraisals and health department data.

Some question may be raised as to the validity of comparing output per plant employee in 1934 with that obtaining in 1929, as the industry undoubtedly benefited from improved equipment and technique in that period. It is not believed, however, that the differences in this respect are material, since a considerable part of the milk-plant equipment used in Milwaukee during the later period originated prior to 1929. More likely, the smaller ratios for the 1934 period are indicative of a lower rate of utilization of labor.

The volume of milk and cream bottled per man was similarly higher in the 92 plants mentioned above than in the Milwaukee plants. The average amount bottled daily per man varied from 676 quarts in the small plants to 940 quarts in the large plants. The comparable range for the Milwaukee plants is from 155 to 1,056 quarts, with the latter figure applicable to a medium-sized concern.

In the study of the 92 plants, some indication was found of a direct relationship between the number of stories in the plant and the number of men employed. No such relationship is discernible from analysis of the Milwaukee plants.

The hours required daily for pasteurization, as given in table 49, are based upon the amounts of milk bottled. In other words, since no consideration was given to the time required for the pasteurization of cream, etc., it is probable that the figures submitted are lower than those required in actual operations.

On the other hand, in estimating the hours required daily to fill and wash bottles, it was assumed that all milk and cream bottled was sold in quart units. The estimates given for the utilization of capacity, accordingly, can be characterized as conservative, and while the data are but rough approximations, due to the use of an arbitrary 5.5-hour standard for a working day, it is believed that they are sufficiently conclusive to indicate that, perhaps with one or two exceptions, there was an overabundance of pasteurizing, bottling, and washing equipment in every plant, notwithstanding the fact that some reserve capacity was necessary to provide for unusual variations in daily and seasonal sales. This situation was found to be true particularly in the small plants. In contrast, plant equipment was fairly well utilized in the large plants; for that matter, if the unused equipment which had been purchased from other distributors by two of the large firms in the market were excluded from consideration, the percentage of utilization of pasteurizing, bottle-filling, and bottle-washing equipment of the largest-size plants, and in turn the averages for the market would be increased appreciably.

What influence the overinvestment in plant had upon the costs of the respective companies is difficult to measure. Considering the market as a whole, it is quite probable that the total volume handled in the market by the 22 plants was not sufficiently great to justify their investment at the time of the survey. This is attested by the fact that the equipment owned by these plants was sufficient to pasteurize 79.5 percent more than the average daily volume pasteurized in April 1934. Similarly, the bottling capacity was 123.7 percent greater, and the capacity of the bottle-washing equipment 93.4 percent greater than that actually used, on an average, during the month in question. These calculations are based on one shift.

Of course, calculations based upon two shifts per day, which may be entirely feasible from an operating point of view, would show much lower utilization of equipment than that estimated on the basis of one shift per day.

The degree to which byproduct equipment was utilized could not be determined. It would seem reasonable to conclude, however, that the degree to which such equipment is utilized during different seasons of the year is subject to greater variation than is milk equipment. Thus, equipment used in producing such products as ice cream, the consumption of which varies markedly between different seasons of the year, may be operated on a 24-hour production basis during peak production periods, and remain unused, or almost unused, during other months.

Little can be said of the relation between size of structures, as measured by floor space, and the number of plant employees and volumes handled. If the plant considered by the appraisers to most closely represent the ideal were used as a standard, it is apparent that a number of plants, as measured by floor space per plant employee, were overcrowded. This criticism is not confined to the small plants. On the other extreme, one of the larger plants was described by the appraisers as being inefficiently operated because the equipment was scattered over an excessive floor space.

DELIVERY

Among the factors affecting cost of delivery analyzed in this section are utilization of equipment and factors affecting the length of route. Before proceeding in this connection, some detail is given of the general characteristics of the existing delivery system.

CHARACTERISTICS OF THE DELIVERY SYSTEM

Of the 25 distributors operating delivery routes in the city on March 16, 1934, 1 was engaged exclusively in wholesale trade. Nine others confined their activities entirely to retail customers. Of the 15 who sold both wholesale and retail, 7 combined a part of their wholesale and retail deliveries and served both from a common route. By company groups, the percentages of total net deliveries represented by retail and mixed sales were as follows: "Old companies—gained," 79.4 percent; "old companies—lost," 79 percent; "new companies," 75.2 percent; "others," 91 percent; and all companies, 78.8 percent. Other details in this respect are indicated in table 50.

An analysis of these data reveals material differences in the delivery characteristics of the several company groups. The old companies which lost business had the greatest concentration of customers (average number of customers per route and per mile of route) on their retail and mixed routes. The average length of route for this group of companies (9 miles) was considerably less than the length of the average route of all other company groups. (See table 51.)

TABLE 50.—Number and kind of delivery routes, number of customers, time required on routes, and net deliveries of 25 specified distributors, Mar. 16, 1934

Type of route and company classification	Number of			Time required on routes	Net deliveries
	Routes ¹	Miles ²	Stops (customers)		
Retail and mixed: ⁴				<i>Hours</i>	<i>Points ³</i>
Old companies—					
Gained.....	105	2,767	18,841	433.3	28,385
Lost.....	460	4,122	100,838	2,204.4	130,504
New companies.....	135	3,503	26,174	736.5	34,794
Others.....	42	1,438	5,833	221.5	8,941
All companies.....	⁴ 742	11,830	151,686	3,595.7	202,624
Wholesale:					
Old companies—					
Gained.....	12	405	917	81.6	7,359
Lost.....	51	862	3,275	359.2	34,696
New companies.....	23	689	875	165.2	11,506
Others.....	3	90	137	21.4	888
All companies.....	89	2,046	5,204	627.4	54,449
All routes:					
Old companies—					
Gained.....	117	3,172	19,758	514.9	35,744
Lost.....	511	4,984	104,113	2,563.6	165,200
New companies.....	158	4,192	27,049	901.7	46,300
Others.....	45	1,528	5,970	242.9	9,829
All companies.....	831	13,876	156,890	4,223.1	257,073

¹ The number of vehicles in use was the same. There were 410 wagons and 332 trucks used on retail and mixed routes, and 13 wagons and 76 trucks on wholesale routes.

² Represents, except for 1 large company which recorded the length of its routes, the computed distance required to cover the route and return. These distances were determined by the survey personnel by tracing on a map the shortest possible distance from the plant to the first customer, and then the shortest distance required to complete the route and return to the plant. In a number of cases, actual driving distance undoubtedly exceeded the computed figures.

³ As used throughout this analysis, a point is equivalent to 1 quart of a fluid commodity, or 1 pound of a nonliquid commodity.

⁴ Retail and wholesale stops on mixed routes could not be identified. Since these stops were predominantly retail, the total has been so considered.

⁵ Includes 463 retail routes and 279 mixed routes.

These data were obtained directly from the distributors' route books and their daily load sheets for the specified date.

TABLE 51.—Important characteristics of the delivery systems of 25 specified distributors, Mar. 16, 1934

Characteristic by type of route	Old companies		New companies	Others	Average all companies
	Gained	Lost			
Retail and mixed:					
Customers—					
Per mile.....	6.8	24.5	7.5	4.1	12.8
Per route.....	179.0	219.0	194.0	139.0	204.0
Points delivered—					
Per customer.....	1.5	1.3	1.3	1.5	1.3
Per mile.....	10.3	31.7	9.9	6.2	17.1
Per route.....	270.3	283.7	257.7	212.9	273.1
Miles per route.....	26.4	9.0	25.9	34.2	15.9
Minutes spent—					
Per customer.....	1.4	1.3	1.7	2.3	1.4
Per mile.....	9.4	32.1	12.6	9.2	18.2
Per route.....	248.0	287.0	327.0	316.0	291.0
Wholesale:					
Customers—					
Per mile.....	2.3	3.8	1.3	1.5	2.5
Per route.....	76.0	64.0	38.0	46.0	58.0
Points delivered—					
Per customer.....	8.0	10.6	13.1	6.5	10.5
Per mile.....	18.2	40.3	16.7	9.9	26.6
Per route.....	613.3	680.3	500.3	296.0	611.8
Miles per route.....	33.7	16.9	30.0	30.0	23.0
Minutes spent—					
Per customer.....	5.4	6.6	11.3	9.3	7.3
Per mile.....	12.1	25.0	14.4	14.3	18.4
Per route.....	408.0	423.0	431.0	428.0	423.0

Computed from data compiled from the distributors' route books and sales records.

The significance of these differences upon delivery costs can be readily visualized. The average number of customers on each retail and mixed route was slightly over 200 for the city as a whole. Five of the large companies had a larger number of customers per route than the average, as high as 233 per route in one case. Six other (small) companies had less than 100 customers per route. If the wage costs of retail route men could be assumed to have been constant throughout the market, this would have meant that unit delivery costs as affected by labor expense (which, as is shown in a preceding section, amounted to about three-fourths of total delivery cost) were from two to three times as high on the routes of the small companies as on those of the larger companies.

Similarly, if truck or wagon expense varies with the distance traveled then that part of unit delivery expense attributable to trucks must have been much higher for the small companies with long routes than for the larger companies with relatively short routes. The average length of retail and mixed routes for the market as a whole was 15.9 miles. The average length of retail and mixed routes of one large firm amounted to but 7.6 miles, yet five companies, one of which was large, had routes averaging over 40 miles in length.

Other indications of the efficiency in retail delivery of the large companies are shown by their relatively large deliveries per route and the relatively low time spent per customer and route.

As is indicated by these data, the variations between companies in the operation of their wholesale routes were considerably less than for the retail routes. In other words, the wholesale routes were presumably better arranged than the retail routes, probably because the former can be more easily adjusted to efficient operation than the latter.

If, other factors being the same, all of the distributors in the market could have had a concentration of deliveries on the retail and mixed routes equal to those of the three old companies which lost business, there would have been a saving in mileage equivalent to 73.2 percent of the total distance of 7,708 miles traveled by them on these routes, or a reduction of 5,630 miles (47.4 percent) of the total distance traveled on retail and mixed routes in the city. It should be noted that these companies did not confine their deliveries to any particular section of the city.

FACTORS AFFECTING COST OF DELIVERY SERVICE

There are numerous factors affecting the cost of delivery service, both for different routes of the same company and between distributors. Perhaps the most important factor affecting the cost of delivery per unit or per customer on different routes is that of the concentration of customers and the size of deliveries to them. If customers were located close together, necessitating few stops and a short time in moving from stop to stop, it would be expected that costs on such a route would be lower than on a route on which customers were scattered. An example of such a situation would be a route servicing a congested area of apartment houses wherein customers may be easily reached, as compared to a route servicing several blocks of single-unit family dwellings. However, it does not follow that costs of delivery per customer are lower in congested than in less densely populated

residential sections due to the possibility that the business might be divided up among several competitors to such an extent that the concentration of customers per route would be no greater than in less densely populated areas. Comparison should be made only between comparable types of routes, i. e., wholesale or retail, since delivery cost per unit on wholesale routes is usually lower than on retail routes, due to larger deliveries per stop and, in general, better organization of such routes.

Differences in delivery costs per unit between companies are due to such factors as differences in organization of routes, density of customers on the routes of the respective companies and in amounts taken by customers, wages and commissions of route men, and type and size of equipment. Again, comparisons should be based on routes handling comparable types of sales, i.e., retail and wholesale, for the reasons given above.

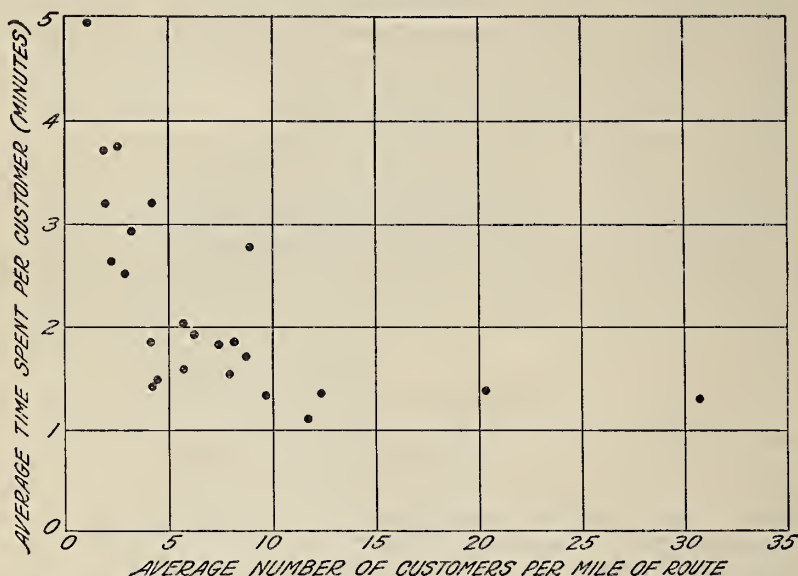


FIGURE 13.—Relationship between the average time spent per customer and the average number of customers per mile on the retail and mixed routes of 24 distributors, March 16, 1934.

Probably one of the most important factors affecting the cost of delivery services between routes and companies is the concentration of customers on the routes, other factors such as the efficiency of route men, wages and commissions paid them being the same. The relationship between the average number of customers per mile of route on retail and mixed routes, taken as a measure of density of customers, and the average time spent per customer in minutes is shown in figure 13. These data are company averages and are not indicative of variations between routes as such. The extent of the variation in such figures between routes of the same company could not be ascertained from the data at hand. Therefore, these data measure, in a general way, differences in operating efficiency measured by average route performance on retail and mixed routes. They are probably subject to some bias, undetermined as to degree and direction, because of variation in the relative amounts sold wholesale on the mixed

routes. Subject to these limitations, the data indicate a rather marked decline in the average time spent per customer as the average number of customers per mile of route increases.

If these delivery data of 1 day, March 16, 1934, obtained in connection with this survey can be accepted as representative of the market, there is considerable evidence to substantiate the contention that the effectiveness in delivery operations of a majority of the participants in the market was quite low. It seems reasonable to conclude that all but the larger companies operated under relatively unfavorable conditions, as far as physical factors are concerned, primarily because their customers were scattered over wide areas, necessitating long routes, a relatively long time per stop, etc.

The foregoing statements, as related to cost, would seem to place the small companies in a relatively high delivery cost bracket, yet this condition would prevail only under the assumption that the cost rates of several items of delivery expense, principally labor, remained constant between companies. Actually this was far from true. As is shown in a previous section, the average wage paid to delivery employees during April 1934 varied from \$135.64 in the case of the larger companies, or those which lost business, to a low of \$86.50 in the case of the smaller (other) companies.

The larger companies operated under relatively favorable route conditions and at the same time paid their route men high wages. The small firms, on the other hand, show a low average number of customers per mile and such other route factors as would tend to be associated with high delivery costs, except wages and commissions to their delivery employees, which were relatively low.

Notwithstanding unfavorable delivery conditions, on a physical input-output basis, the small (other) companies had a unit delivery cost per stop during the first 4 months of 1934 of less than one-half that of the larger companies, a portion of the difference being attributable to the fact that these companies paid lower wages than their competitors. (See table 52.) The contention that the larger companies paid high delivery wages lest their route men transfer their services to other companies, and consequently draw away a part of the regular customers, may have some significance in this connection.

TABLE 52.—Average delivery costs per stop on wholesale and retail routes of specified groups of distributors, first 4 months, 1934

Company classification	Average delivery per stop	Delivery cost per stop	
		Total	Labor
	<i>Points</i>	<i>Cents</i>	<i>Cents</i>
Old companies:			
Gained	1.81	4.39	3.12
Lost	1.59	5.27	3.95
New companies	1.71	4.51	3.22
Others	1.65	2.42	1.82
Average all companies	1.64	4.94	3.66

Based upon audits and sales records.

It is difficult to determine the influence of investment in delivery equipment upon nonlabor costs of delivery. If, however, the assumption that delivery overhead varies in proportion to investment in

delivery equipment is valid, there is substantial evidence to indicate that the small (other) companies operated under a relatively favorable overhead on delivery equipment, even though their deliveries were predominantly to the retail trade. (Table 53.) While average daily sales of milk and cream per delivery employee were higher for the "other" companies than for the old firms which lost business, they were smaller than for the companies in the other two groups.

TABLE 53.—*Volume of daily sales per delivery employee, and sound value of delivery equipment per delivery employee and unit of sales of specified groups of distributors, April 1934*

Company classification	Average daily sales of milk and cream (milk equivalent) per delivery employee ¹	Sound value of delivery equipment (Apr. 30, 1934) per—	
		Delivery employee	Quart of milk and cream (milk equivalent) sold daily
Old companies:	<i>Quarts</i>	<i>Dollars</i>	<i>Dollars</i>
Gained	265	485.22	1.83
Lost	197	414.67	2.11
New companies	235	² 610.20	2.60
Others	206	259.81	1.26
Average all companies	210	440.51	2.09

¹ A consideration of total deliveries, rather than of milk and cream, presumably would tend to minimize the variations between groups.

² If 1 company with delivery equipment valued at \$746.81 per employee were excluded, the average for this group would be reduced to \$454.35.

Computed from appraisals of 25 companies and health department data.

UTILIZATION OF DELIVERY EQUIPMENT

The extent of utilization of delivery equipment is an important factor affecting delivery costs. With properly arranged routes and a proper association between the size of delivery equipment and the volume distributed, the number of vehicles tends to be reduced, and, in turn, costs tend to be at a minimum. A low degree of utilization indicates a poor combination of delivery factors.

The capacity of the vehicles actually in use on March 16, 1934, was determined by a comparison of actual deliveries with the computed number of standard 12-quart cases which each vehicle could have carried, allowing ample room for the driver to work. On the basis of this rated capacity (which is understated because unused vehicles were not taken into consideration) it was found that the average utilization of equipment on all routes (wholesale, retail, and mixed) operating in the city on March 16, 1934, amounted to 59.5 percent. If it could have been possible to operate each vehicle at the point of its maximum capacity, the number in use could have been reduced from 831 to about 494. That part of the total delivery cost attributable to vehicles probably could have been reduced in somewhat the same proportion. Total delivery wages likewise could have been reduced due to the reduction in the number of route men, but probably not in the same proportion as the number of trucks.

The above figures represent average utilization with respect to gross deliveries, or the total amount of products loaded on the wagons at the plant. While no estimates of the degree of delivery equipment

utilization, based on gross load, can be given for wholesale and retail routes separately, some indication of the average proportion of total capacity used on retail and mixed routes and on wholesale routes can be obtained from a consideration of net deliveries. Net deliveries represent the commodities actually disposed of on the route and, hence, are distinguished from gross deliveries by the amount of products not delivered. On this basis, the average utilization of all delivery capacity amounted to 55.7 percent, as compared with 59.5 percent as measured in terms of gross load. The utilization of equipment was found to be lower on the retail and mixed routes (54 percent) than on the wholesale routes (62.9 percent). The utilization of capacity is therefore overstated due to the fact that route returns are excluded from net deliveries.

The average percentage of delivery capacity utilized by net deliveries is shown by company groups in table 54. Rather significant differences appear between the several company groups but the use of this classification is not entirely justified in that the companies which are considered together are not entirely homogeneous. Thus, the variations between companies in the "others" group are greater than those between the several company groups. The distributor who most effectively utilized his retail delivery equipment (at 77.2 percent of capacity) and the one with the lowest degree of utilization (23.9 percent) are both included in this group.

TABLE 54.—*Utilization of delivery capacity actually operated by specified groups of distributors, Mar. 16, 1934*

[Based upon net deliveries]

Company classification	Type of route		
	Retail and mixed	Wholesale	All routes
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Old companies:			
Gained.....	52.3	50.8	52.0
Lost.....	55.1	70.3	57.7
New companies.....	51.1	55.6	52.1
Others.....	56.9	44.8	55.6
Total.....	54.0	62.9	55.7

Based upon measurements of actual capacity of the equipment of 25 distributors as of Mar. 16, 1934.

A classification of the companies according to the percentage of utilization of their delivery capacity shows that on the retail and mixed routes of 24 firms operating these routes, 9 utilized their capacity at less than 40 percent, 11 others varied from 41 to 60 percent, and the remaining 4 show a utilization from 61 to 80 percent. Six of the seventeen companies engaged in wholesale distribution used their delivery equipment at less than 50 percent of capacity, while four others utilized their equipment at more than 80 percent of capacity. As stated above, there appears to be no relationship between size of concern and the extent to which the delivery vehicles were loaded.

In general, the size of the average retail delivery vehicle used by each company was found to be proportional to the size of the firm, and in turn to the average volume handled on each route, varying from a capacity of about 518 points per vehicle in the case of the larger companies (the old companies which lost business between 1930 and

1934) to a low of about 374 points per vehicle in the case of the smaller (other) companies. This situation was not true with several of the smaller companies. The average capacity of retail trucks in the market was 506 points.

Sufficient importance may be attached to the composition of route returns (wholesale and retail) to warrant a brief discussion at this point. From table 55 it is apparent that the bulk of the total gross load on wholesale and retail routes was composed of regular milk. In absolute volumes, as measured in points, route returns were similarly largest for this commodity. In relative terms, however, the returns of regular milk, amounting to 3.8 percent of the gross deliveries of that product, were less than the returns of any other product except skim milk (2.3 percent of its gross deliveries). Taken together, the returns of all the other products amounted to 12.5 percent of their gross deliveries. Returns were relatively highest on sour cream, amounting to about one-third (32.7 percent) of all sour cream taken on the routes.

TABLE 55.—*Composition of gross deliveries, net deliveries, and route returns, on wholesale, retail, and mixed routes of 25 distributors, Mar. 16, 1934*

Product	Gross deliveries	Net deliveries	Route returns as a percentage of—		
			Total route returns	Total gross load	Gross deliveries of the product
	Percent	Percent	Percent	Percent	Percent
Regular milk.....	70.30	72.20	42.21	2.67	3.82
Grade A milk.....	5.07	4.77	9.43	.60	11.77
Special milk.....	5.03	5.01	5.24	.33	6.59
Light cream.....	3.04	2.66	8.62	.55	17.94
Heavy cream.....	.70	.57	2.67	.17	24.11
Sour cream.....	.13	.09	.66	.04	32.64
Skim milk.....	.44	.45	.16	.01	2.26
Chocolate drink.....	1.61	1.50	3.31	.21	12.99
Buttermilk.....	4.41	4.07	9.48	.60	13.58
Butter.....	4.01	3.57	10.50	.66	16.57
Creamed cottage cheese.....	3.27	3.22	4.13	.26	7.98
Plain cottage cheese.....	1.99	1.89	3.59	.22	11.41
All products.....	100.00	100.00	100.00	6.32	6.32

Based upon the distributors' sales records and route books.

DUPLICATION OF DELIVERY SERVICES

Duplication in delivery services has been measured from three different approaches: (1) examination of the route books of the milk companies making deliveries in 6 selected areas of the city; (2) analysis of the consumers' questionnaires with respect to duplication in 201 selected blocks (fig. 8), and (3) number of distributors serving the same premises. Of these, the first and second are applicable to retail and mixed routes only.

Some indication of the duplication in delivery service may be obtained by making a comparison of the distance traveled on delivery routes and total street mileage. Presumably there were 815 miles of street in Milwaukee proper and 282 miles in the suburbs, or a total of 1,097 miles. Even under a system of distribution where the total distance traveled was at the lowest possible minimum, the total route distance (counting outward and inward trips) probably would be from two to three times the street mileage, or from about 2,200 miles

to 3,300 miles. With 25 competitors in the market this distance would probably be increased. The total mileage traveled on the retail and mixed routes of the 25 Milwaukee firms amounted to 11,830 miles. The total distance of their wholesale routes amounted to 2,046 miles.

The 6 selected areas studied in this connection covered 1,020 blocks. (See fig. 14.) Duplications in delivery service, i. e., delivery in a block by more than 1 company, were found for all but 1 of the blocks included; deliveries were made by 5 or more companies

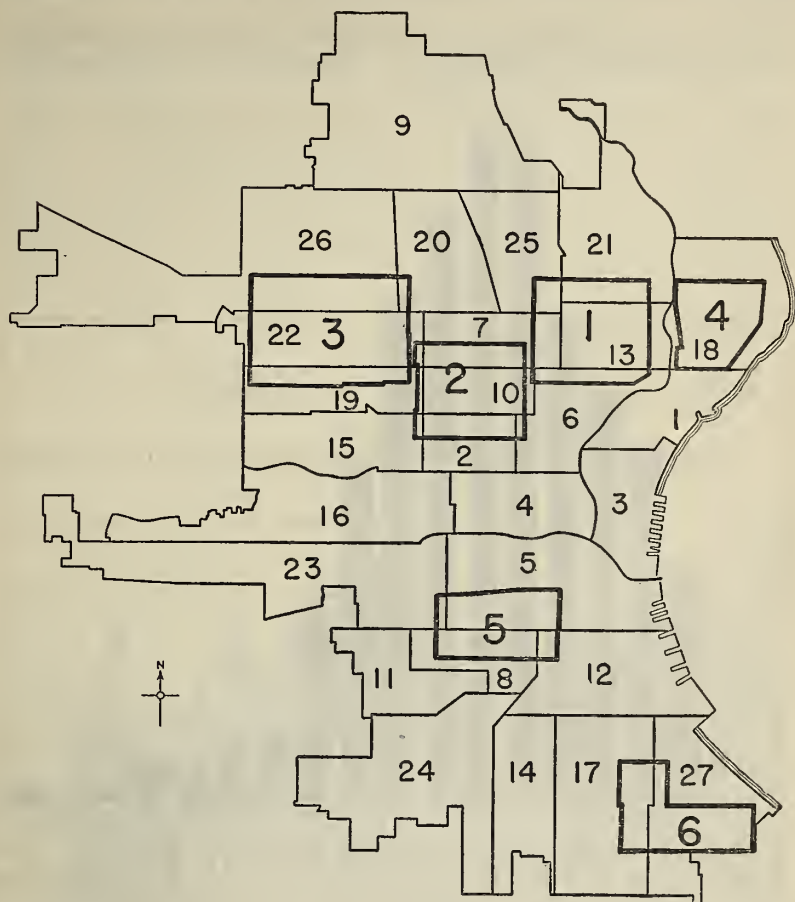


FIGURE 14.—Location of the six areas studied for duplication of delivery service, March 16, 1934.

in 800 of the 1,020 blocks. The most frequent number of companies making deliveries to the same block was found to be 7, with this situation occurring in 147 different cases; 6 companies were likewise found to be making deliveries in 146 different blocks. The extreme cases were observed in area 2, where in 2 blocks 15 companies, and in another block 17 companies, were found to be competing with each other.

Considering the 6 areas in total, there were 5,948 overlappings of service, or an average of 5.8 duplications for every block included.

These averages ranged from a high of 7.8 duplications in area 2 to a low of 3.1 duplications in area 4. The average number of duplications in areas 1, 3, 5, and 6 were 6.9, 4.9, 6.3, and 3.3, respectively. Further details of the frequency of duplications are depicted in figure 15.

The results presented above may be compared with data obtained from the consumers' study, which, as has been pointed out at an earlier point, were based upon an analysis of 201 blocks scattered throughout the city. The latter, in consequence, are likely to be more representative of the situation in the city as a whole than the former.

Data from the consumers' survey with respect to overlapping of services are presented in figure 16. The number of duplications in

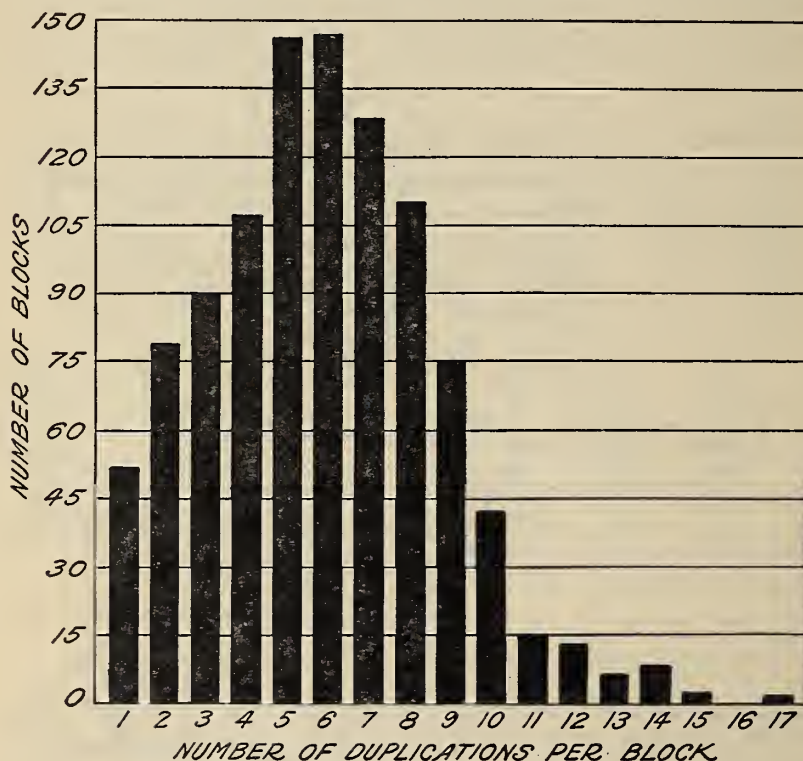


FIGURE 15.—Frequency of duplications in delivery service within six selected areas (1,020 blocks), March 16, 1934.

each block averaged 6.6, which is somewhat higher than the figure of 5.8 obtained from the analysis of the 1,020 blocks. On a ward basis, the results show that no ward (1930 basis) was served by less than nine companies. (See figure 17.) Deliveries were made by at least 15 companies in 14 of the 25 wards,⁵³ with 20 companies competing in wards 12 and 25. This means that most of the wards were served by a majority of the milk companies in the city.

An indication of the extent of the territory served by the respective distributors can be readily gained from the following: Eight or more

⁵³ Since the wards were not completely surveyed, it is probable that the results are understated.

of the companies had customers in 21 or more wards of the city, with at least two of these companies delivering in every ward of the city. Eight other companies operated in from 11 to 20 wards. Only one company concentrated its deliveries in one ward.

Another measure of duplication in delivery service involves the frequency in deliveries to individual premises. Two determinants figure in this connection: (1) The number of companies delivering

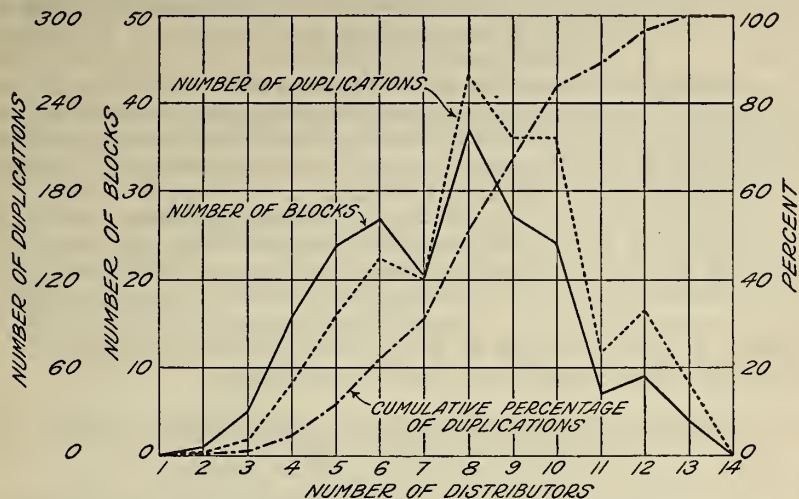


FIGURE 16.—Frequency of duplications in delivery service as found in 201 scattered blocks, March and April 1934.

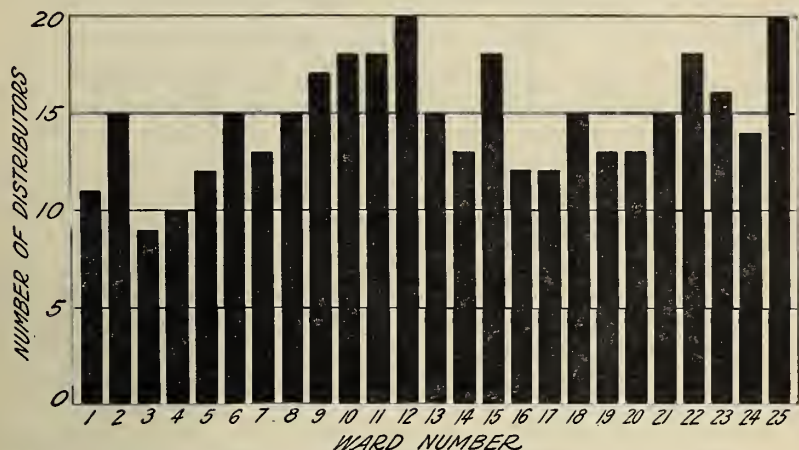


FIGURE 17.—Number of milk distributors found delivering in the several wards (1930 basis), March and April 1934.

to buildings, or groups of buildings having a common entrance such as a walk, gate, or doorway, and (2) the number of firms delivering to a single customer. The first is applicable largely to multiple-family dwellings but is nevertheless an important criterion in this respect.

It would appear that duplications in delivery service, even to individual premises, were significantly large. Thus, 17.7 percent of the total number of premises in question were visited by route men of

two or more distributors. In two cases, nine companies were found to be delivering to the same location. Considering, as before, deliveries by more than one company to represent duplications, the results indicate that the total number of duplications was slightly less than one-fourth (24.1 percent) of the total number of premises visited.

The number of families contacted which were found to be purchasing their milk supply from more than one company was not large, since 94.1 percent of the families patronized one distributor only. Of those families who purchased from more than one distributor, 5.6 percent claimed to be purchasing from two companies, and 0.3 percent from three companies. The most general explanation which the housewives gave for their division of patronage was that while they preferred the products of certain companies they did not wish to jeopardize the position of the route men of other companies by limiting patronage to the company they preferred.

As would be expected, a number of wholesale customers were found to be purchasing their dairy products from more than one company. (See table 56.) In the case of stores, restaurants, and hotels, this duplication can probably be explained on the basis of consumer preference for special brands. A possible explanation for the division of business by bakeries might be attributable to the belief that better service and prices would result from this procedure.

TABLE 56.—*Number of distributors patronized by specified wholesale establishments, March and April 1934*

Number of distributors patronized	Relative number of wholesale establishments			
	Stores	Hotels	Restaurants	Bakeries
	Percent	Percent	Percent	Percent
1.....	44.8	59.9	71.0	86.2
2.....	33.9	20.0	24.0	13.8
3.....	19.4	6.7	5.0	-----
4.....	1.9	6.7	-----	-----
5.....	-----	6.7	-----	-----
Total.....	100.0	100.0	100.0	100.0

Based upon questionnaires submitted by the establishments.

IV

PROPOSED UNIFIED PROCESSING AND DISTRIBUTION SYSTEM ⁵⁴

The main purpose of the study of the Milwaukee milk market was to evaluate the possibilities of developing a unified processing and distributing system for milk in Milwaukee. The directors of the study therefore designed a unified system of milk processing and distribution apparently without giving much attention to the possibilities of increasing the efficiency of the existing system of milk handling.

Among the several alternative methods by which wastefulness and inefficiency in existing methods of milk handling might be eliminated are the following:

- Zoning of the sales territories between distributors in order to eliminate overlapping of delivery routes and duplications in service;

- Public control of prices and margins in a manner somewhat similar to the present methods of regulating public utilities;

- Unifying the delivery function where probably the greatest savings in cost might be effected, but permitting the receiving, processing, and similar functions to be operated under competitive conditions as they are at present; and

- Granting a monopoly to one or more firms and subjecting their operations to public control.

In designing the unified processing and delivery system it was judged that costs would be lowest when operations were conducted from a central city plant with assembly handled largely through country stations. The proposed system was set up not only to take care of the fluid milk and fluid cream trade in the market, but also with a view towards providing facilities for handling all dairy products consumed in Milwaukee and its suburbs. Whether the operation of the contemplated system should be restricted to the processing of fluid milk, cream, and other very closely related products, or should include such products as butter, dry skim milk and the like, and restricted to the city of Milwaukee or inclusive of its suburbs, could not be conclusively answered from the data at hand. A serious question also might be raised as to the necessity and feasibility of a plan integrating a very large butter manufacturing plant with a plant designed to handle the fluid milk and fluid cream requirements of the city.

A description and appraisal of the proposed unified system are set forth in the following pages. It should be realized that while the investment figures and operating cost data represent the best judg-

⁵⁴ The results presented in this section are based upon findings in the field by personnel not connected with the U. S. Department of Agriculture, as submitted in a report to the Dairy Section of the Agricultural Adjustment Administration. Complete details of design, arrangement, specifications for buildings and equipment, plot plans and machinery layout, and some sections and elevations for the plants are included in this report. Largely because of the complexity of the data, verification has been limited to the checking of estimates and the like.

ment of the persons who designed the plant, they are necessarily hypothetical and must be interpreted accordingly.

GENERAL ASPECTS

In devising the proposed unified system, it was apparently contemplated that:

- The properties and goodwill of all existing distributors would be acquired, presumably through outright purchase, and that no new distributors would be allowed to enter the market; and
- The establishment and operation of the proposed central plant and unified distribution system would be vested in the hands of some one agency, private or public, with an exclusive franchise for the market.

The primary function of the system would be that of pasteurizing and delivering fluid milk and cream. However, since the operating and seasonal surplus would have to be disposed of, facilities are specified for the conversion of excess milk into manufactured products. No product except powdered skim milk would be manufactured which would need to be sold outside of Milwaukee. Products which would be handled include the following: Regular, Grade A, and Vitamin D milk, cream, chocolate milk, buttermilk, butter, ice cream, cottage cheese, and powdered skim milk.

Due to the possibility of change in the dietary habits of consumers, changes in population growth and localization, and particularly in the technical phases of the dairy industry, it was not deemed advisable to make provision for capacities beyond 1950. Accordingly, the proposed plant is designed to meet existing requirements, but with sufficient allowance for such future requirements as could be visualized.

ESTIMATES USED IN DEVELOPING CAPACITY OF PROPOSED PLANT

Of the several population estimates available to the survey, those of the Research Division of the Milwaukee Water Department appeared most adaptable, primarily because cognizance is given to the population of the suburbs, as well as of the city.⁵⁵

The 1930 population figures (U. S. Census) of Milwaukee city, its suburbs and of Milwaukee County (the population of the county exclusive of Milwaukee and its suburbs is largely rural, only a small part of which is served by distributors of the city), and the water department estimates for 1940 and 1950 are as follows:

Year	Milwaukee city	City and suburbs	Milwaukee County
1930.....	578, 249	679, 934	725, 268
1940.....	685, 700	825, 000	890, 000
1950.....	800, 000	1, 000, 000	1, 070, 000

Available data relative to dairy-product consumption in Milwaukee were analyzed by the designers as a means of determining capacity requirements, based on consumption rates in 1934, and those in-

⁵⁵ It is pointed out above that the proposed plant is designed to accommodate those customers normally served by the Milwaukee distributors, namely, the residents of Milwaukee, Cudahy, Fox Point, Shorewood, South Milwaukee, Wauwatosa, West Allis, West Milwaukee, and Whitefish Bay.

creases which would need to be met due to increased per-capita consumption rates and population growth.

Data from three sources, namely, the Milwaukee Health Department, the consumption study made in connection with this survey, and the Consumer Analysis of the Greater Milwaukee Market, 1934,⁶⁶ indicate that a pasteurizing capacity of 100,000 pounds an hour would be ample to provide for the milk requirements of Milwaukee as obtaining in 1934. Data from the former source indicate average daily sales of milk of slightly less than 458,000 pounds. The daily rate of milk consumption found in the consumers' survey (0.722 pint) applied to a population of 637,500 shows a slightly larger amount, 460,000 pounds. The rate of consumption as published in the Consumer Analysis of the Milwaukee Journal applied to the same population results in a total somewhat in excess of 500,000 pounds of milk daily.

On the basis of the foregoing, the proposed pasteurizing equipment, with a capacity of 100,000 pounds an hour, would be operated about 5 hours daily to pasteurize a volume of milk equal to that estimated to have been consumed daily in 1934; by 1950 the pasteurizing time would probably average from 7 to 8 hours daily. If found necessary, however, the report stated that milk could be pasteurized for at least 15 hours a day.

From an analysis of the sales of cream during a 7-year period, 1928-34 inclusive, as reported by the health department and the results of the consumption study, it appears that equipment for 18,000 pounds of cream daily would meet requirements. As measured in milk equivalent (converted at the rate of 6.5 pounds of milk for 1 pound of cream) this would necessitate the separation of 117,000 pounds of milk each day.

Three separators are specified for the proposed plant, each with an hourly capacity of 11,000 pounds. Since one of the three units is intended to be used primarily for separating cream from returned milk, the other two would need to be operated between 5 and 5.5 hours daily to meet cream requirements. If found necessary, however, the third unit could be utilized 3 hours daily without increasing operating time. This is equivalent to a reserve capacity of about 30 percent. Pasteurization and bottling capacities are planned accordingly.

The demand for vitamin-D and chocolate milk has increased so rapidly in the last few years that it was difficult to accurately estimate future requirements. The plans call for enough vitamin-D units to process 25 percent of the total volume of fluid milk, which is considerably in excess of present requirements, and enough floor space is reserved to permit installation of sufficient vitamin-D units to treat all fluid milk.

Two chocolate vats are specified with a capacity equal to 10 percent of the fluid-milk volume.

According to findings in the consumption study, the average rate of buttermilk consumption in March and April 1934, was 0.011 quart a day per capita. Applied to the population served by Milwaukee distributors, this is equivalent to about 15,000 pounds daily. Since buttermilk is a hot-weather food, it is probable that facilities for a

⁶⁶ Compiled by the Research Bureau of the Milwaukee Journal from questionnaires as of Jan. 15, 1934.

considerably larger volume would be necessary.⁵⁷ Accordingly, equipment sufficient for the production of 40,000 pounds a day is specified. It was contemplated that whatever surplus would remain would be converted into powdered form.

The per capita consumption of butter in Milwaukee during March and April 1934, averaged 0.078 pound daily. On this basis, total daily consumption of this product during the spring of 1934 was only slightly less than 50,000 pounds. This figure is in close agreement with the findings published in the Consumer Analysis of Milwaukee,⁵⁸ yet, according to the latter only 43.7 percent of the package butter consumed in Milwaukee was produced locally during the first part of 1934. Assuming this percentage to be representative of both bulk and package butter, total production of this commodity in Milwaukee in 1934 probably amounted to about 22,000 pounds daily.

Under the proposed set-up, 25,000 pounds of butter would be manufactured in 8 hours, or if necessary 50,000 pounds in 16 hours. This reserve appears to be entirely ample to cover seasonal variations in consumption.⁵⁹ In order to provide for further increases in volume, resulting either from a larger rate of consumption or an increased consumption of local butter, enough floor space is provided to permit installation of six additional churns, increasing the capacity to 100,000 pounds a day on a 16-hour production basis.

The ice cream requirements were estimated at 244,500 gallons for the month of peak consumption (July). On the basis of 25 working days, this would mean about 10,000 gallons a day. Equipment is planned, accordingly, for the production of 1,400 gallons an hour or about 10,000 gallons in 7 hours.⁶⁰

It is anticipated that after meeting the daily requirements for milk, cream, butter, and ice cream, there would be an excess of milk, both whole and skim, during 9 months of the year, August, September, and October excluded. A part of this surplus would be utilized in such quantities as required in the manufacture of cottage cheese, which would be the only type of cheese processed; the remainder would be processed into powdered skim milk.⁶¹

LAYOUT FEATURES

To meet the foregoing requirements, a system was designed which includes five country receiving and processing stations and a city establishment for the pasteurization, bottling, etc., of milk and cream, and the production of the above named byproducts. A system of delivery is also included which would operate from the city station.

A single pasteurizing plant was chosen only after careful study. The designers estimated that for the same total capacity in two plants as compared with a single plant, equipment and direct labor costs would be increased about 50 percent, and direct overhead labor costs and service charges for refrigeration, power, and heating probably would be increased by a somewhat larger percentage. It was esti-

⁵⁷ For seasonal variations in the retail sales of buttermilk in New York City, see Ross, H. A., Some Factors Affecting the Demand for Milk and Cream in the Metropolitan Area of New York. U. S. Department of Agriculture, Tech. Bul. No. 73, p. 24, June 1928.

⁵⁸ *Ibid.*, p. 47. Estimated total annual consumption of butter (package and bulk) reduced to a daily basis.

⁵⁹ For seasonal variations in the retail sales of butter in New York City, see Ross, H. A., *ibid.*, p. 24.

⁶⁰ This figure is derived from data of the Milwaukee Journal's Consumer Analysis.

⁶¹ The specifications call for skim milk drying equipment sufficient to process 700,000 pounds of skim milk daily (on a 24-hour production basis) with facilities provided for the installation of additional equipment to process 180,000 pounds a day.

mated that the cost of pasteurizing in two plants would be somewhere between one and one-half to two times the cost in a single plant. Furthermore, it was pointed out that the problem of control would become more complex.

Special consideration was also given to the number and location of country stations. On the basis that no shipper should be more than 2 hours away from a receiving station, five plants were chosen, to be located within a radius of 20 miles from Milwaukee, each of which would receive about the same volume of milk.⁶²

A system of country assembly in some cases results in economies when transportation is made in large-scale units, such as tank cars and tank trucks. However, it should be recognized that the milk shed is largely in a 20-mile radius of Milwaukee, and the roads leading into the city are good. In other words, the increased expenses resulting from the establishment and maintenance of the country stations must be reconciled with the advantages which can be gained thereby. It has not been possible to determine from the data at hand whether country-station assembly or direct shipment is more feasible for the Milwaukee market. In view of the fact that the central system was designed by a corps of experts, there is at least a presumption in favor of the view that a country-station assembly system is the more efficient.

The principal difficulty in handling the entire milk requirements from a central station is that encountered in transporting the milk to and from the plant. It was believed by the designers that a considerable part of this difficulty would be obviated by assuming a location for the central plant where sufficient space would be available for the necessary loading and unloading platforms. A centralized distribution system was agreed upon only after it was found that costs of delivery from a central point would be lower than costs from branch stations.⁶³ It was estimated that the costs of delivery from a branch station, large enough to accommodate a hundred one-man trucks, located 7 miles from the central station, would be considerably in excess of the costs of delivery from a central station.

On the basis of the foregoing, a system of delivery was devised which apparently is predicated to a considerable extent upon the plans submitted some years ago for Rochester, N. Y.⁶⁴ Under this system, all deliveries, both wholesale and retail, would be made from one vehicle. For the congested areas, large trucks carrying two deliverymen in addition to the driver are recommended; for less congested areas two-man and one-man trucks are specified. In contrast with horse-drawn vehicles contemplated in the Rochester plan, which was developed before the widespread use of motor-driven delivery vehicles, only motorized trucks would be used under the Milwaukee plan.

Sixteen buildings were contemplated for the proposed system, plot plans of which are shown in figures 18 to 21, inclusive. The central plant would consist of five buildings, namely, a two-story (part three-story) main processing plant and office building; a three-story ice-cream plant; a two-story power plant and machine shop, and two two-story buildings for garages, storage, etc. After the architectural

⁶² The location of producers, upon which the location of country plants was based, was largely determined from Mortensen's studies of the Milwaukee milk market for the period 1926-30.

⁶³ Based on an analysis by the designers of the centralized system of costs of distributing from substations.

⁶⁴ North, Charles E., Report of Rochester Milk Survey by the Committee on Public Safety of the Common Council, pp. 10-11, 1919.

details were completed it was decided that building no. 5 (one of the garages) was unnecessary, and while included in the plot plans, the costs of same were excluded. Receiving stations 1, 2, and 3 would consist of three buildings each: For power, one-story; receiving, one-

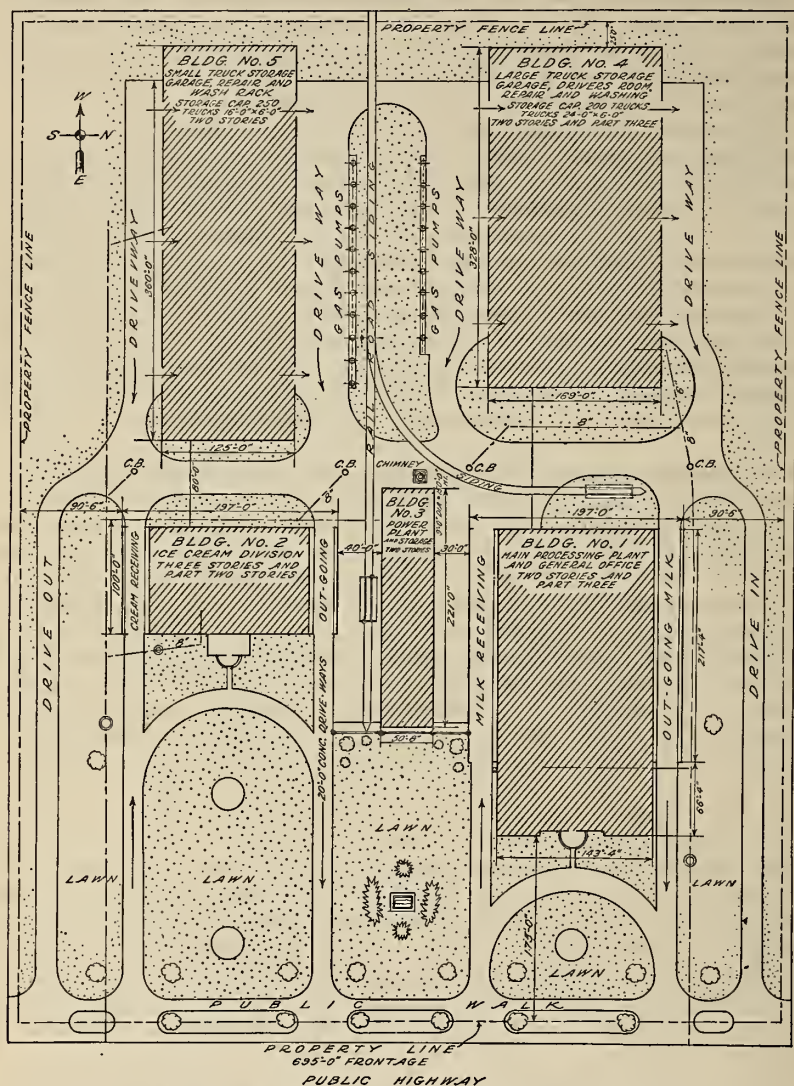


FIGURE 18.—Plot plan for the main central plant of the proposed unified system.

story; and processing, two-story. Receiving stations 4 and 5 would each consist of a single-story building.

The total land requirements for the above amount to 24.5 acres, divided as follows: 10.5 acres for the city plant; 3.9 acres for country plants 1 and 3; 4.2 acres for plant 2; and 1 acre each for country plants 4 and 5.

Without going into the architectural and engineering details, it may be of interest to point out a few of the highlights of the contemplated structures. The buildings specified apparently are designed for as scientific production of the products as known technique permits. Air conditioning is specified throughout, with double doors and forced

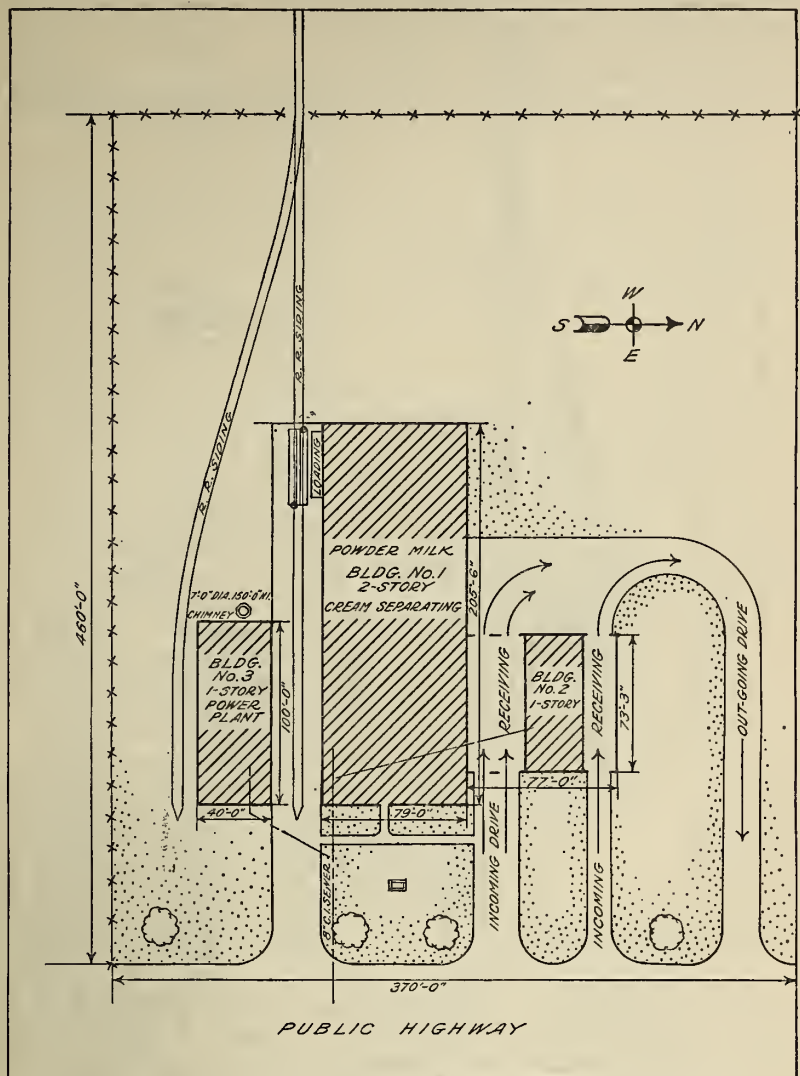


FIGURE 19.—Plot plan of country stations nos. 1 and 3 of the proposed unified system.

drafts in the vestibules which would prevent unconditioned air from entering. It appears that details of construction have been worked out with great care to prevent the accumulation of dust or debris of any nature. The construction contemplated is probably much better, and in turn somewhat more expensive, than found in the usual milk plant.

DESCRIPTION OF OPERATIONS

PLANT

The milk collection system would be practically the same as at present, with the producers either hauling their milk to the receiving

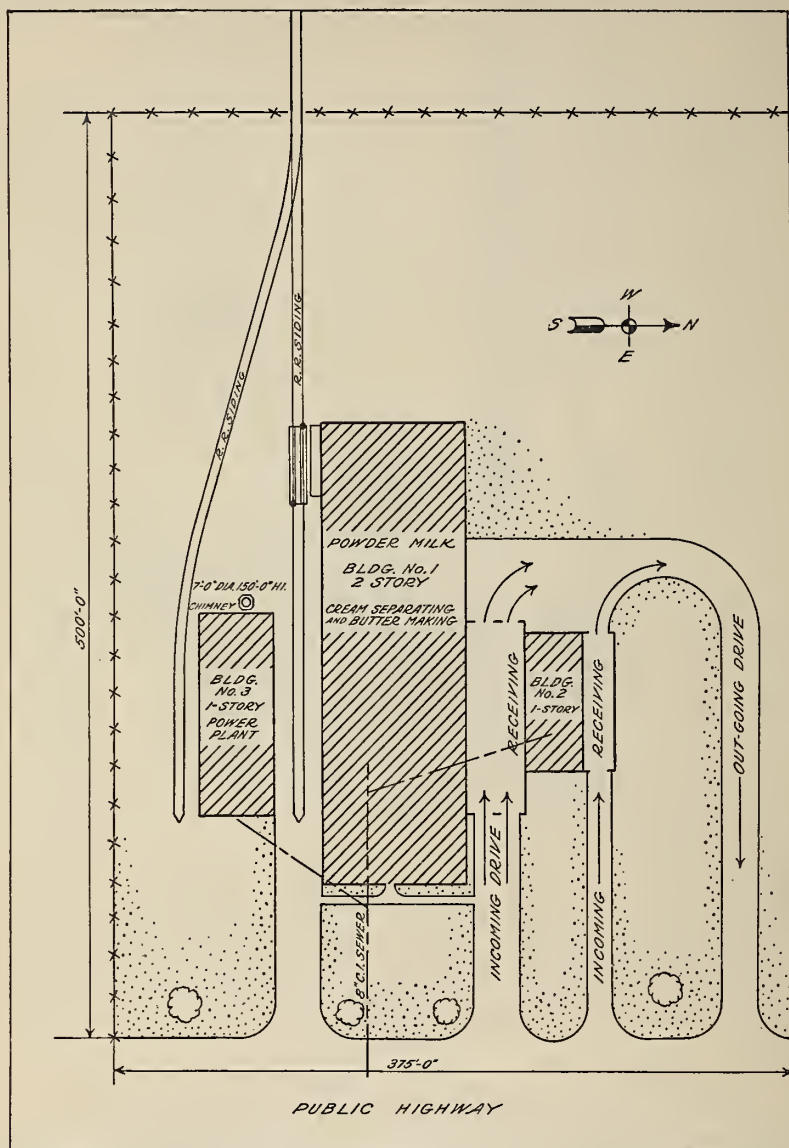


FIGURE 20.—Plot plan of country station no. 2 of the proposed unified system.

stations, or hiring it done by haulers. However, it was contemplated that the hauling routes would be so arranged as to minimize, or if possible, to eliminate the existing duplication resulting from haulers

traveling over the same roads. By so doing, the cost of milk hauling presumably would be lowered.

On the basis of the estimates given, an average of approximately 1,480,000 pounds of milk would be handled daily, varying from a high of 1,750,000 pounds a day in June, to a low of 1,240,000 pounds a day in October. Two collections would be made each day shortly after each milking, with the result that the consumer would be insured of a product probably 12 to 24 hours fresher than is normally delivered. However, no estimates are available to indicate the additional cost involved in two collections per day. This is a rather unusual procedure in milk markets, and appears to be unnecessary in the Milwaukee milk market.

The milk to be used for fluid consumption would be received at country stations 4 and 5, since they would be located closest to the city. Facilities are planned for the handling of milk at the rate of 50,000 pounds per hour at these plants.

All milk received at the country plants would be handled uniformly as follows: The incoming cans would be automatically conveyed from the receiving door past an automatic cover lifter (and in cold weather over a thawing unit), thereby enabling the operator to get a sample for laboratory tests.⁶⁵ The milk would then be automatically dumped into stainless-steel weighing tanks, weighed, and by gravity flow emptied into stainless-steel dump tanks. From this point, the milk would be pumped in to tank trucks for delivery to the processing plant, or stored in tanks provided for that purpose.

The can-washing equipment specified is automatic throughout. With this type of equipment no handling is necessary from the time the cans are lifted from the trucks upon arriving until they are reloaded on the trucks with covers in place.

Milk to be received at receiving station 1 would be handled as in 4 and 5, but would be used for processing only. From the storage

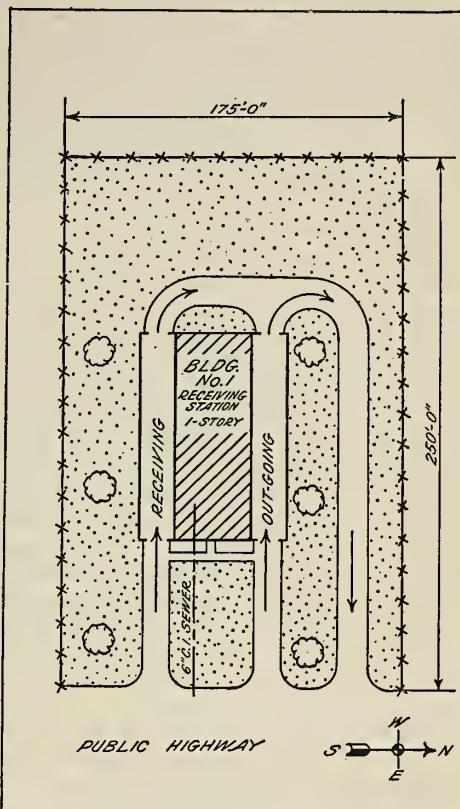


FIGURE 21.—Plot plan of country stations nos. 4 and 5 of the proposed unified system.

⁶⁵ Sufficient equipment is planned for all 5 country stations to make the necessary laboratory tests. The main test room, for scientific research and development work, would be located at the central plant.

tanks provided, the milk would be pumped through preheaters on the second floor and on through feeder heaters into separators. Cream from the separators would then flow, by gravity, over surface coolers and would be stored in surge tanks. Pumping would then be necessary to get the cream through flash pasteurizers which would also act as pumps, thence over surface coolers for final cooling on the second floor. From this point, the cream would be lowered into holding tanks on the first floor to await trucking to station 2 for conversion into butter.

The skim milk resulting from separation at station 1 would be processed there into powdered milk.⁶⁶ From the separators the skim milk would be passed over surface coolers into holding tanks on the first floor, from which it would be pumped through preheaters and hot wells into vacuum pans for condensing. The residue would then be lowered into a drop tank, pumped through internal tube coolers and eventually into storage tanks until such time as it could be pumped into the drying room for the final processing operation, barreling and weighing.

It is expected that the amount of milk to be received at station 2 would be equal to that received at station 1. The operations are identical with respect to separating and drying. An additional function, however, that of butter making, is planned for this station.

For manufacturing the butter, the cream separated at this station, as well as that trucked from stations 1 and 3, would be stored in cream-ripening vats on the second floor of this plant from which it would be pumped into churns for processing. After churning, a fresh water rinse in the churns is specified. From the churn room, the butter, now in boxes of suitable size to accommodate butter-printing machines, would be trucked into the chilling room and partially hardened, thence delivered by elevator to the cutting and packaging rooms. The contemplated equipment for these operations has a capacity of 3,000 pounds an hour. The storage room facilities planned are adequate to hold the volume of butter until needed at the city plant.

The buttermilk resulting from the churning operations, estimated at about 40,000 pounds daily, would be cooled and passed into storage tanks from which a sufficient quantity would be conveyed to the city plant for daily requirements. At the central plant the buttermilk would be pumped to the second floor of the pasteurization building, stored in vats where it would be cultured and passed over coolers before going into the bottling line.

Country station 3 would differ from station 1 only by the inclusion of an ice-cream-mix department. Sufficient cream would be stored at this plant to meet the requirements for ice cream. Sugar hoppers and additional mixing tanks would be installed. From these mix tanks the product, after homogenization, would be placed in storage tanks ready for conveyance to the city plant. At the city plant the mix would be pumped up to the third floor of the ice-cream plant for storage, processed on the second floor, and hardened and automatically packaged, in cartons or cans, on the first floor.

From the above, it is shown that the fluid milk delivered to the city for bottling, estimated at approximately 500,000 pounds a day for whole milk requirements and 117,000 pounds for cream requirements,

⁶⁶ Adequate equipment, 2 drying rooms completely equipped, is planned for country station 2 to compensate for whatever shortages in powdered milk might arise in station 1.

would originate from country stations 4 and 5, butter and buttermilk from station 2 and ice-cream mix from station 3.

The fluid milk, upon arrival at the city plant, would be pumped through one of four sanitary lines to the third floor for processing. The milk to be irradiated would flow directly through Vitamin D units and be pumped into storage tanks, while milk not put through the irradiation process would be pumped directly into the storage tanks. Following through on the same floor, the milk would be pumped through regenerative preheaters, then through a series of four filters in addition to the final filters into pasteurizing tanks. After pasteurization, the milk would be automatically emptied into surge tanks located next to the pasteurization tanks, and pumped through regenerative coolers for precooling. The specifications call for the location of the final coolers on the second floor, to which the milk would be fed by gravity. From the surface coolers the milk would be dropped into filler tanks on the first floor.

All milk bottles are to be automatically filled, capped, and conveyed to the cold room. Automatic fillers are recommended because of the resulting sanitation, elimination of splashing, leaking, and over-running of milk.

Soaker and force-rinser type bottle-washing equipment is recommended.

The fluid cream would be processed as automatically as fluid milk. The raw milk, in holding tanks on the third floor, would flow by gravity to feeder heaters on the second floor, and through the separator. Plans call for the location of the pasteurizing tanks on the second floor, from which the cream would flow over surface coolers down into the filling machine tanks on the first floor and eventually to cold rooms to await distribution. The skim milk from the separators would be pumped into cottage cheese vats and converted into cottage cheese or other products.

Chocolate milk would be processed on the second floor of the pasteurizing plant. Chocolate sirup would be mixed with whole or skim milk, according to consumer demands, in copper-kettle mixers, followed by pumping through homogenizers. After homogenizing, the product would be pasteurized, cooled on surface coolers, and passed into the filler line.

All bottled milk and cream returned by the trucks from delivery routes would be passed through the receiving department, automatically decapped, and pumped to the second floor where it would be preheated, separated, cooled, and passed into holding tanks. The fat would be churned into butter or processed into ice cream.

It is evident from the foregoing description that operations would be as automatic as modern machinery permits, and that the entire production layout would allow a straight and uninterrupted flow of products from receiving through the final loading for distribution. The net result would be that of efficiency and economy in plant operation.

DELIVERY

From analyses of consumption by wards, revised basis, and costs of acquisition and operation of one-man, two-man, and three-man trucks, it was decided that three-man trucks would be most feasible in all of the wards except 9, 24, and 26, and in the suburbs of Shorewood

and West Milwaukee. Medium-sized trucks (two-man) are proposed for ward 26, Fox Point, and Whitefish Bay, and small trucks for wards 9 and 24, Cudahy, South Milwaukee, West Allis, and Wauwatosa. In all, 214 insulated and mechanically refrigerated trucks are specified, divided into the following: 149 large, 44 medium, and 21 small units.

In addition to the route vehicles, the specifications call for equipment for interplant hauling and ice-cream delivery. For the former, 8 tractors and 14 semitrailer tanks of 2,500-gallon capacity are planned. For the latter, 30 trucks of 275-gallon capacity are deemed sufficient.

PERSONNEL REQUIREMENTS

A summary of the estimated number of personnel necessary to operate the proposed central plant and unified distribution system is indicated in table 57, with a detailed distribution, by functions, shown in the supporting schedules to the operating cost data.

TABLE 57.—*Recapitulation of the estimated number of employees required for the operation of the proposed central plant and unified distribution system*

Classification	Main plant			Country station number					Total
	Pas- teuriz- ing, etc.	Ice cream	Deliv- ery	1	2	3	4	5	
Direct overhead.....	3	2	5	9	9	9	9	9	55
Direct labor:									
Receiving.....				10	10	10	12	12	54
Processing.....	96	31		36	46	40			249
Power and refrigeration.....	46	(¹)		34	34	34	12	12	172
Delivery.....			672						672
Total direct labor.....	142	31	672	80	90	84	24	24	1,147
Total direct overhead and labor..	145	33	677	89	99	93	33	33	² 1,202

¹ Included with pasteurization.

² This total is exclusive of 95 individuals classified as management overhead. The total personnel is, therefore, 1,297.

Compiled from the report submitted by the designers of the proposed unified system.

On the basis of a 40-hour week for operating labor, with the exception of a 44-hour week for delivery men, it was estimated that the services of 1,297 individuals, employed in two and in other cases three shifts a day, would be required as follows: Management 95, direct overhead 55, and direct labor 1,147.⁶⁷ Over 50 percent of the operating labor is apportioned to the delivery department.

As is pointed out in subsequent pages, the cost of labor represents the most important item of operating expense for the proposed system. For that reason it is important to determine at least in a general way the adequacy of the personnel estimates with respect to both the minimum requirements for the several operations and the reserve or relief help which must necessarily be provided to insure uninterrupted operations. For certain departments, the estimates appear to be liberal; in others, without evidence to the contrary, somewhat deficient.

⁶⁷ According to the designers, the personnel estimates were carefully considered and discussed with numerous dairy-plant equipment manufacturers.

On first impression, the estimates for the engineering staff appear to be high. However, the personnel required for interplant trucking functions presumably are designated as maintenance men of the engineering department. According to the designers, the concentration of 10 engineers into a single staff of technical supervisors is justified in that the six proposed generating plants would be manned by watch engineers only, and as a result an economy in engineering personnel would be effected similar to that of a large number of utility operating companies.

In contrast, the provisions for office clerical help appear to be somewhat inadequate. The estimates call for 50 office employees for the main plant and an aggregate of 24 additional employees for the country stations. Assuming that the office personnel under a unified system would be no more efficient than those under competitive business, it is questionable whether the proposed number of employees could handle the route records on the one hand, and the patrons' records on the other, and still perform adequate accounting, statistical, and other necessary office functions. In actual operations, the number of routes which one clerk can handle is about 10, with an average of about 6 or 7. Since the proposed routes would be much larger than ordinary, it is doubtful if one clerk could handle more than the average number of routes indicated.⁶⁸ A further question concerns the feasibility of decentralizing the office functions.

The most important matter in connection with the adequacy of personnel pertains to the estimates submitted for direct labor. Whether the direct, or operating, labor as stipulated would be sufficient must to some extent go unanswered, since there are but few standards with which the estimates may be compared.

In regard to the route men, the estimates are largely a matter of personal opinion and experience, since comparative data for the projected delivery system, where all stops in a block or street would be made from one vehicle, were not available for any comparable city in the United States. In view of this circumstance, the estimates represent projections based upon simulated test deliveries on retail routes,⁶⁹ and union rates and rules then in effect in Milwaukee. It was estimated, accordingly, that the services of 556 men would be required for the 214 delivery routes. It should be noted that this number represents the minimum force necessary to man the 214 delivery trucks as described above. This means, in effect, that no provision is made for relief riders. The delivery week for each man was based upon a 7-day period of about 6.3 hours a day. If each delivery man were given 1 rest day a week, as is often the case in milk markets, about 80 or 90 additional delivery employees would be needed.

A question also arises as to whether 556 men employed on 214 routes would be ample to service the territory specified. Using an average delivery of 1.5 points per stop of 40 seconds,⁷⁰ it was estimated that 556 men would be needed to distribute approximately 276,000

⁶⁸ Based on statements of various specialists in the dairy processing field.

⁶⁹ Test deliveries were made on retail routes under conditions resembling as much as possible those encountered under ordinary circumstances. These tests were conducted in sections described as thinly populated, ordinary residential, and typical apartment-house areas. Results of these experimental deliveries showed that the most efficient delivery obtained when one-man, two-man, and three-man trucks were utilized in the above areas, respectively, and the average time required to serve each customer was 40 seconds.

⁷⁰ It would seem difficult for the delivery man to serve customers at an average rate of 40 seconds per customer. To begin with, the route man has to go around many fences in making his deliveries and climb quite a few flights of stairs in multiple-unit residences. Under existing conditions, also, the customers have cards for extra orders, etc., so that the route man has to return to his truck for more goods in many cases. Furthermore, during a considerable portion of the year the streets and walks are slippery.

points daily. This represents an average of about 500 points per man, or 1,500 points a day for the three-man trucks, 1,000 points a day for the two-man trucks, and presumably 500 points a day for the one-man trucks. These estimates are not unreasonable on the bases computed, yet, the weighted average delivery, retail and wholesale, in the market as of March 16, 1934, was 1.65 points per stop rather than 1.5 points. Assuming the composition of the delivery loads to be the same under a unified distribution system as that obtaining in the market during the spring of 1934,⁷¹ the total volume to be delivered would equal about 332,500 points, assuming 287,000 points of milk and cream, rather than 276,000 points. If this reasoning is valid, then the total number of stops daily would be increased by about 10 percent, necessitating either an increased delivery per man by that amount, or, if the given average delivery per man represents the maximum volume which could be handled by each route man, an increase in the number of personnel by about one-tenth, or 56.

In the absence of supporting details, it is difficult to perceive the effectiveness of a delivery system based on the assumption that the composition of each ward is sufficiently homogeneous to warrant but one type of delivery vehicle therein (i. e., three-man trucks exclusively, etc.), and that wholesale and retail deliveries could be made from the same vehicle during the same trip. Wholesale deliveries are usually made much later in the morning than retail deliveries. Consequently, the feasibility of a single delivery route covering both wholesale and retail stops would depend to no small extent upon the adjustments which could be made in routine delivery methods.

The number of route collectors specified appears ample. However, the number of route foremen, 16 for 214 routes, or an average of about 13 routes for each foreman, is somewhat below that required in actual operations, notwithstanding the fact that the route collectors would relieve the route foremen of a part of their usual duties. Cases where foremen have handled over 10 delivery routes are the exception rather than the rule. Considerable emphasis is added to this statement when it is realized that the majority of contemplated routes would be much larger than the ordinary.

Comparison of the number of the plant employees under the proposed system with the number ordinarily required in existing plants is made somewhat difficult by the fact that a part of the functions generally carried on in the city plants would be performed in the substations. Another limitation is apparent in that the only standards available are those of milk plants of considerably smaller size. In view of these factors, it must be assumed that the operating labor proposed for the country plants is reasonable. Comparison is restricted, therefore, to the estimated personnel for the proposed city plant with personnel found in competitive milk plants.

Clement and his associates found that the largest volume of milk and cream handled per plant employee, including engineers but not office clerks, was 267 gallons a day.⁷² This situation was observed in 6 plants which employed an average of 103 men each for 27,448 gallons daily, of which 88 percent was bottled.

Considerable economies could no doubt be effected in the proposed pasteurization plant which would not be possible in smaller plants.

⁷¹ See table 5L.

⁷² Clement, C. E., Le Fevre, P. E., Bain, J. B., and Grant, F. M., *op. cit.*, p. 36

At the same time, it appears doubtful if 173 employees, including those of the laboratory and engineering departments and chargeable in part to ice cream, could handle approximately 71,700 gallons of milk and cream, a total of 617,000 pounds of milk, for bottling a day, in addition to the volume used for ice cream, buttermilk, etc. On this basis, each employee at the main plant would be required to handle an average volume of about 415 gallons daily for the bottled trade.

In view of the foregoing, it would appear that the number of plant personnel as estimated is lower than would be required in actual operation, in spite of the fact that a part of the normal operations would be performed by men at the country plants.

ESTIMATED COSTS

CAPITAL EXPENDITURES

The initial cost of the entire set-up was derived by the same method as that used in appraising the existing dairy plants, namely, the application of unit prices with only the ordinary trade discounts deducted. No account was taken of the possibilities of lower prices offered by competition between bidders for a large-scale contract or any special discounts to governmental agencies. Apparently, estimates, based on costs prevailing as of May 1934, were made for all capital expenditures except those for land, which, according to the designers would presumably add approximately \$22,000 to the totals as given below, office equipment, and bottles, cans, cases, etc. However, it should be noted that the estimated capital expenditures for delivery equipment are based upon costs of 214 route trucks only. This is the minimum number needed to cover the proposed routes. It is quite essential that several reserve trucks should be provided for use in the event of breakdowns or for handling extra loads.

The total cost of buildings and equipment was estimated at \$5,099,960.17, divided into the following: Buildings \$2,251,516.39, and equipment \$2,848,443.78. A recapitulation of these costs is shown in table 58.

The estimated expenditures are based upon costs for new equipment. Undoubtedly these figures would be materially reduced if the estimates had been made on the assumption that at least a part of the existing plant equipment could be utilized in the centralized system. For comparative purposes, however, it is but logical that the above figures should be used, since the main objective was that of providing facilities for products of the highest quality obtainable, and the differential between costs under a system using new equipment and those obtaining under the competitive system would tend to be conservative, due principally to the heavier carrying charges on a larger investment for the unified system.

The above costs are inclusive of contemplated structures and equipment only. These figures do not include the expenditures which would be necessary to acquire the milk plants of the existing distributors, having a sound value of approximately \$3,500,000 as of April 30, 1934, or their byproduct enterprises, valued at approximately \$1,753,000.

OPERATING COSTS

The reliability of operating costs estimated for a proposed system of operation may be open to considerable question; for a number of specific costs, such estimates would be found to vary considerably

when translated from hypothetical to actual operations. On the other hand, estimates for other charges, such as depreciation and interest, may be accepted as fairly accurate, since the range of variations in the bases from which these costs are taken is definitely calculable. With the exception of the several reservations cited heretofore, the following data can probably be accepted as a fair index of operations for the contemplated system. Furthermore, since these estimates are based upon conditions prevailing for the same period as that for which data are available for existing plants, direct comparisons may be made.

TABLE 58.—*Estimated capital expenditures of the proposed central plant and unified distribution system*

[Based upon costs prevailing as of May 1934]

Asset classification	Main plant	Receiving station number					Total
		1	2	3	4	5	
Buildings:¹							
Pasteurizing-----	\$497, 282. 07						\$497, 282. 07
Processing-----		\$185, 499. 68	\$224, 954. 04	\$185, 499. 68			595, 953. 40
Ice cream-----	207, 133. 09						207, 133. 09
Receiving-----		42, 235. 61	42, 735. 60	42, 235. 61	\$53, 462. 50	\$53, 462. 50	234, 131. 82
Power-----	93, 364. 32	49, 346. 81	57, 034. 97	49, 346. 81			249, 092. 91
Garage-----	467, 923. 10						467, 923. 10
Total-----	1, 265, 702. 58	277, 082. 10	324, 724. 61	277, 082. 10	53, 462. 50	53, 462. 50	2, 251, 516. 39
Equipment:							
Pasteurizing-----	357, 889. 96						357, 889. 96
Receiving and processing-----		140, 750. 50	215, 732. 70	149, 421. 50	28, 926. 00	28, 926. 00	563, 756. 70
Ice cream-----	78, 361. 00						78, 361. 00
Power-----	556, 920. 00	115, 600. 00	210, 100. 00	137, 600. 00	55, 980. 00	55, 980. 00	1, 132, 180. 00
Delivery (trucks)-----	716, 256. 12						716, 256. 12
Total-----	1, 709, 427. 08	256, 350. 50	425, 832. 70	287, 021. 50	84, 906. 00	84, 906. 00	2, 848, 443. 78
Grand total-----	2, 975, 129. 66	533, 432. 60	750, 557. 31	564, 103. 60	138, 368. 50	138, 368. 50	5, 099, 960. 17

¹ Includes chimneys and yard and outside, but with no allowance for the cost of land. The estimated cost of building no. 5 (1 of the 2 garages) is not included. These building cost estimates, made by the engineers, represent 90 percent of the architects' estimates.

Taken from the summary in the designers' report.

Total operating costs were estimated to equal \$11,408.72 daily. Of this amount, slightly over 50 percent, or \$5,764.08, is represented by labor costs, exclusive of power and refrigeration labor. A summary of daily operating costs is given in table 59, followed by supporting schedules in tables 60 to 63, inclusive.

Depreciation is computed at the rate of 2.5 percent per annum on buildings, 12.5 percent per annum on trucks, and 8 percent on all other equipment. These rates are presumably lower than those specified by the International Milk Dealers' Association, yet they are apparently reasonable, and, for that matter, are based upon depreciation studies as of January 1931, published by the Bureau of Internal Revenue of the United States Treasury Department. All buildings would be of concrete and steel construction with an actual serviceable life of 75 to 100 years. Accordingly, the depreciation rate on buildings is entirely ample, since it is based on a useful life of but 40 years. The depreciation rate on trucks is based on a useful life of 8 years. This is in accordance with Milwaukee experience.

TABLE 60.—*Estimated daily costs of power plant, including maintenance for the proposed central plant*

Expense	Main plant	Country station No.					Total
		1	2	3	4	5	
Depreciation and interest:							
Buildings	\$19. 18	\$10. 14	\$11. 72	\$10. 14			\$51. 18
Equipment	198. 35	41. 17	74. 83	49. 01	\$19. 94	\$19. 94	403. 24
Operating labor	191. 92	133. 00	133. 00	133. 00	50. 33	50. 33	691. 58
Power (purchases)	111. 22				7. 65	7. 65	126. 52
Coal	82. 75	59. 58	153. 00	64. 55			359. 88
Fuel oil					5. 24	5. 24	10. 48
Ammonia, etc., including maintenance	40. 00	30. 00	40. 00	30. 00	5. 00	5. 00	150. 00
Total	643. 42	273. 89	412. 55	286. 70	88. 16	88. 16	1,792. 88

Taken from the report submitted by the designers.

TABLE 61.—*Estimated number and average daily cost of general office personnel required for the proposed central plant and unified distribution system*

Designation	Number	Total daily wage cost	Designation	Number	Total daily wage cost
General manager	1	\$54. 80	Chief engineer	1	\$16. 44
Assistant general manager	1	27. 40	Operating maintenance and research engineers	3	32. 88
Office employees	50	230. 14	Office and testing engineers	2	16. 44
Field men	25	136. 99	Assistants	4	19. 73
Chief chemist	1	13. 70			
Assistant chemist	1	8. 22			
Assistants	6	23. 01		95	1 579. 75

¹ Management overhead is distributed in percentage between departments as follows: Pasteurization, 23.65; ice cream, 6.77; delivery, 15.50; and country plants, 54.08 percent. The latter figure is allocated between the 5 country plants in the following manner: Plant 1, receiving 2.36, processing 11.15; plant 2, receiving 2.87, processing 15.22; plant 3, receiving 2.20, processing 11.50; plants 4 and 5, receiving stations only, are charged 4.39 percent each.

Taken from the report submitted by the designers.

TABLE 62.—Estimated number and daily wage cost of suboffice personnel for the proposed central plant and unified distribution system

Designation	Main plant				Country station No.										Total			
	Pasteurizing, etc.		Ice cream		Delivery		1		2		3		4				5	
	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages	Num- ber	Wages		
Superintendents.....	1	\$16.67	1	\$16.67	1	\$15	1	\$8.33	1	\$8.33	1	\$8.33	1	\$6.67	1	\$6.67	8	\$86.67
Assistant superintendents.....	2	16.66	1	8.33	4	20	4	11.34	4	11.34	4	11.34	4	10.66	4	10.66	3	24.99
Office help.....	Chemists.....						1	5.83	1	5.83	1	5.83	1	5.83	1	5.83	24	75.34
Chemists.....	Girl assistants.....						3	8.50	3	8.50	3	8.50	3	8.50	3	8.50	5	29.15
Girl assistants.....							9	34.00	9	34.00	9	34.00	9	31.66	9	31.66	15	42.50
Total.....	3	33.33	2	25.00	5	35	9	34.00	9	34.00	9	34.00	9	31.66	9	31.66	55	288.65

Based upon designers' report.

TABLE 63.—Estimated number and daily wage cost of direct labor personnel for the proposed central plant and unified distribution system

Designation	Main plant		Country station No.								Total	
	Num-ber	Wages	1		2		3		4		5	
			Num-ber	Wages	Num-ber	Wages	Num-ber	Wages	Num-ber	Wages	Num-ber	Wages
Receiving.....			10	\$35.00	10	\$35.00	10	\$35.00	12	\$42.00	12	\$42.00
Processing.....												
Separating.....			8	28.00			8	28.00				
Condensing.....			16	62.00	16	62.00	16	62.00				
Dry room.....		\$52.00	12	48.00	12	48.00	12	48.00				
Butter.....					18	81.25						
Ice cream and mix.....	31	107.33					4	22.00				
Pasteurizing.....	6	24.00										
Bottle filling and washing, etc.....	77	290.50										
Delivery.....												
Route men.....	556	3,892.00										
Route foremen.....	16	120.00										
Collections.....	100	600.00										
Total direct labor.....	799	5,085.83	46	173.00	56	226.25	50	195.00	12	42.00	12	42.00
Refrigeration.....												
Power.....	14	60.92	8	36.67	8	36.67	8	36.67				
Engineers.....	3	15.00	3	15.00	3	15.00	3	15.00	1	18.33	1	18.33
Firemen.....	3	12.00	3	10.00	3	10.00	3	10.00	3	18.33	3	18.33
Oilers and helpers.....	6	24.00	6	19.00	6	19.00	6	19.00				
Maintenance and relief.....	20	80.00	10	40.00	10	40.00	10	40.00	8	32.00	8	32.00
Outside.....			4	12.33	4	12.33	4	12.33				
Total power and refrigeration.....	46	191.92	34	133.00	34	133.00	34	133.00	12	50.33	12	50.33
Grand total.....	845	5,277.75	80	306.00	90	359.25	84	328.00	24	92.33	24	92.33

Based upon the designers' report.

The most serious question on the adequacy of depreciation arises in connection with equipment other than trucks, namely, the use of a rate of 8.0 percent to cover all power-plant and milk-processing equipment. According to the designers, the power-plant equipment, with a value of \$1,132,180, would have a normal life of 20 to 25 years; of the million dollar investment in milk-processing equipment, an appreciable part would be represented by tanks, pumps, and motors with an equally long serviceable life. In view of these facts, the average rate of 8 percent was deemed sufficiently liberal to provide ample reserves for writing off any equipment that might become necessary due to expiration of the assets or obsolescence due to changes in plant technique.

The schedule of salaries which were set up for executives should be attractive to the best men in the field. It is probable that these estimates are somewhat higher than would be found to be necessary in actual operation.

The salary and wage rates specified for other personnel are likewise considerably higher than probably would need to be paid. If this were found to be the case in actual operation, it would compensate to some degree for the increased cost necessitated by expansion in personnel, which appears to be necessary for the reasons given in the preceding pages.

Costs of operation of the two-man and three-man trucks were based upon estimated figures of maintenance of a large truck manufacturer. The cost data for the one-man trucks are comparable to those observed in Milwaukee under then existing conditions and checked against experience figures of a manufacturer of such trucks.

Presumably, the allowance of \$925 a day would be ample to cover the cost of supplies, bottles, bottle caps, cases, cans, cartons, etc. It would seem preferable, however, to treat containers as assets, and charge expense only with the depreciation thereof.

FEASIBILITY OF PROPOSED SYSTEM

For the purposes of this report, the expected results of operation under the proposed unified processing and distributing system are compared with the results obtaining under the present system in three respects: unit delivery, plant and related costs, and the subsequent effects upon producers and consumers; effects of investment and capacity upon operating costs; and finally, factors more or less unrelated to costs bearing upon the practicability or impracticability of unification.

Operating costs of the existing distributors are departmentalized on a processing, delivery, selling, and general and administrative account classification. From the cost schedules submitted for the unified system it is impossible to segregate expenses on similar departmental lines. Consequently, while unit operating expenses of the existing plants are consolidated in such manner as to permit comparisons with the anticipated costs under the unified system, these comparisons must be interpreted in the light of stipulated reservations. (See table 64.)

TABLE 64.—*Estimated unit costs of operation for the proposed unified system compared with costs obtaining under the competitive system, first 4 months, 1934*

Unit costs of operation	Unified system	Competitive companies ¹		
		Average	High	Low
Per quart of milk receipts:				
Processing, selling, and administration—	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
Labor.....	0.28	0.69	1.94	0.37
Other than labor.....	.55	.75	2.08	.64
Total.....	.83	1.44	4.02	1.01
Delivery—				
Labor.....	.68	1.38	1.45	.61
Other than labor.....	.14	.48	1.04	.27
Total.....	.82	1.86	2.49	.88
Total operating costs—				
Labor.....	.96	2.07	3.39	.98
Other than labor.....	.69	1.23	3.12	.91
Total.....	1.65	3.30	6.51	1.89
Per quart of milk and cream sales: ²				
Processing, selling, and administration—				
Labor.....	.68	1.05	3.05	.61
Other than labor.....	1.32	1.19	3.29	1.08
Total.....	2.00	2.24	6.34	1.69
Delivery—				
Labor.....	1.62	2.15	2.29	1.02
Other than labor.....	.35	.76	1.64	.45
Total.....	1.97	2.91	3.93	1.47
Total operating costs—				
Labor.....	2.30	3.20	5.34	1.63
Other than labor.....	1.67	1.95	4.93	1.53
Total.....	3.97	5.15	10.27	3.16

¹ Based upon costs of 20 companies obtaining during the first 4 months of 1934.

² In a comparison of costs on this basis, it should be recognized that the proration of total operating costs under the unified system over a relatively smaller proportion of total output than for the competitive companies tends to make the unit costs for the unified system appear relatively less favorable than when based on receipts.

Costs for the unified system were computed from data included in the designers' report; those for the competitive companies are based upon audits of their books and upon health department data.

Total operating costs of the unified system, as measured in units of milk receipts, are shown to be about one-half the average costs obtaining in the market during the first 4 months of 1934. As measured on this basis, there are indications that economies of considerable magnitude could be effected by the operation of a central plant and unified distributing system, notwithstanding the fact that the costs as submitted for the unified system may be lower than those which could be expected to prevail under actual operations for the reasons pointed out above. Total costs of operation for the most efficient firm in the market amounted to 1.89 cents for each quart of milk receipts as compared with an estimated cost of 1.65 cents under the proposed system.

A correct interpretation of these figures depends to no small degree upon an understanding of the similarity or dissimilarity in functions of the enterprises in question. It should be realized that the bottled trade would represent only about 40 to 50 percent of the total volume handled under the unified system as compared with about 60 to 65 percent for the competitive companies during the first 4 months of

1934. In the absence of definite data on the processing costs of the several commodities, it is difficult to discern the differential in costs attributable to this factor. The proration of total delivery costs under the unified system, over a volume which constitutes a relatively smaller part of the business than that of the competitive companies, results in the latter appearing relatively less favorable than would otherwise be the case.

The company having the lowest unit operating costs in the market conducted a business of which about 60 percent of the volume constituted fluid-milk sales, distributed mainly on wholesale routes. Inasmuch as delivery costs per unit of product are generally lower for wholesale routes than for retail routes, it is probable that the delivery costs of that company are lower than would be the case had the volume of products distributed on the routes been wholesale and retail in the proportions found for the market as a whole.

The proration of operating costs over the volume of milk and cream (in milk equivalent) sold, important primarily with respect to delivery expenses, shows that total unit operating costs for the lowest cost firm in the market were less than those estimated for the unified system.⁷³ To what extent this variation is due to differences in function rather than efficiency in operations cannot be readily discovered.

Examining the unit costs of delivery further, it is of interest to compare the costs per stop as indicated in table 65. Since the highest and lowest cost firms were selected on the basis of total operating costs, it does not follow that the range of variation in delivery costs per stop for the market is indicated from these data. This explains, in fact, why the average delivery cost per stop of all distributors is lower than the cost for the lowest cost firm.⁷⁴

TABLE 65.—*Estimated delivery costs per stop under the proposed unified system compared with costs obtained under the competitive system, first 4 months, 1934*

Delivery cost per stop	Unified system ¹	Competitive companies ²		
		Average	High	Low
	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>	<i>Cents</i>
Labor.....	2.31	3.66	3.93	3.56
Other than labor.....	.50	1.28	2.80	1.58
Total.....	2.81	4.94	6.73	5.14

¹ Based on deliveries of 332,500 points daily at a weighted average rate, wholesale and retail, of 1.648 points per stop.

² Using the same companies as in table 64.

Costs for the unified system were computed from data included in the report submitted by the designers; those for the competitive companies are based upon audits of their books.

In table 66 the reproductive and sound values of the fixed assets of 23 firms are compared with the estimated investment for the proposed unified system both in absolute amounts and in terms of receipts, sales, and employees. In this connection it is necessary to point out that the values given for the 23 companies include the investment of approximately \$1,659,000, sound value, in buildings and equipment of byproduct plants, as indicated in table 29, but excludes all invest-

⁷³ Two firms, in addition to the one specified, had unit operating costs below those estimated for the proposed unified system.

⁷⁴ The cost per stop to this firm was high presumably because the business was principally wholesale.

ment in land. The latter is excluded since no investment for land is included for the proposed system.

TABLE 66.—*Estimated capital investment for the proposed central plant and unified distribution system compared with the reproductive and sound values of plants of 23 companies as of Apr. 30, 1934*

Investment	Unified system	23 companies ¹	
		Reproductive value	Sound value
Buildings:			
Total.....	\$2,251,516.39	\$2,937,404.98	\$2,354,621.91
Per quart of milk receipts.....	.0090	.0193	.0155
Per quart of milk and cream sales.....	.0215	.0307	.0246
Per plant employee.....	4,740.03	5,958.23	4,776.11
Factory equipment:			
Total.....	2,132,187.66	2,720,103.04	1,751,949.11
Per quart of milk receipts.....	.0085	.0179	.0115
Per quart of milk and cream sales.....	.0204	.0285	.0183
Per plant employee.....	4,488.81	5,517.45	3,553.65
Delivery equipment:			
Total.....	2716,256.12	1,115,131.35	603,854.31
Per quart of milk receipts.....	.0028	.0073	.0040
Per quart of milk and cream sales.....	.0068	.0117	.0063
Per delivery employee.....	1,065.88	852.55	461.66
Total investment:²			
Total.....	5,099,960.17	6,772,639.37	4,710,425.33
Per quart of milk receipts.....	.0203	.0445	.0310
Per quart of milk and cream sales.....	.0487	.0708	.0493
Per employee ⁴	3,932.12	3,238.95	2,252.71

¹ Values of fixed assets as of Apr. 30, 1934, compared with total volumes reported for the year 1934.

² Includes 30 ice cream trucks valued at \$62,583.60 and interplant trucking equipment valued at \$92,112.08.

³ Total investment in milk and nonmilk plants, but exclusive of land and office furniture and equipment.

⁴ Based on total personnel employed.

Based upon the designers' report of the unified system, plant appraisals, and health department data.

Based on these data, it appears that the total investment in the unified system, as measured by total value, would be less than the reproductive value of the plants of the 23 companies, but slightly more than the sound value of these plants, and would appear even more favorable if compared to the total investment in all companies. It is estimated that total investment per quart of milk receipts and per quart of milk and cream sales would be less under the unified system than for the competitive companies. The investment per employee is higher under the unified system than for the competitive companies. Reconciliation of this difference would depend partly upon the determination of the deficiency of estimated personnel on the one hand, or the excess employed by the competitive firms on the other. However, it appears reasonable to believe that the number of employees under the proposed system would be relatively low, probably about 30 percent less than the number employed by the competitive plants, and the investment per employee relatively high, because the machinery and equipment which would be used would be as automatic as possible, and a greater degree of specialization in labor would be attained.

The largest discrepancy between investment per employee under the unified system and that under the competitive system is found for delivery equipment. Considering in this respect the capital expenditure of the one with the sound value of the other, it is apparent that the ratio for the former is slightly over $2\frac{1}{4}$ times that for the

latter. Using this as the sole criterion, the conclusion might easily be that the proposed investment for delivery equipment is entirely disproportionate to the number of employees, and hence, economically unjustifiable with respect both to initial cost and overhead charges. However, it should be recognized that the estimates for personnel are probably inadequate, the trucks specified are of the insulated and mechanically refrigerated type, permitting the delivery of products with but minimum impairment of quality and the higher overhead charges under the unified system likely would be more than compensated by the diminution in direct operating charges resulting from a more efficient utilization of capacity and personnel, and a very substantial reduction in operating mileage through the elimination of duplications in service.

It is estimated that total delivery distance under the unified delivery system could be reduced from 13,876 miles, which was the total of wholesale and retail routes as of March 16, 1934, to about 3,900 miles. This represents a decrease of almost 10,000 miles a day or close to 72 percent of the total mileage of the competitive companies.

Plant characteristics of the proposed central plant, including the country stations, are compared in table 67 with those of 22 companies. Because of the diversity of functions performed by the various enterprises, the reduction of plant characteristics to a common basis on the presumption of standardization in function and layout must necessarily be of limited value.

TABLE 67.—*Characteristics of the proposed central plant compared with those of the competitive plants*

Characteristic	Unified system	22 companies		
		Average	High	Low
Average daily receipts per employee (quarts).....	1,469.0	845.0	¹ 1,410.0	174.0
Average daily sales of milk and cream per employee (quarts).....	604.0	541.0	¹ 1,056.0	155.0
Hours required daily:				
Pasteurization ²	5.0	3.0	6.3	0.6
Bottle filling ³	4.2	2.4	5.7	0.4
Bottle washing ³	4.2	2.7	5.7	0.3
Estimated utilization of capacity ⁴ (percent):				
Pasteurization ²	90.9	55.7	117.9	10.8
Bottle filling ³	76.1	44.7	107.2	7.0
Bottle washing ³	76.1	51.7	107.2	4.9
Floor space (square feet):				
Per employee ⁵	390.0	588.0	1,587.0	302.0
Per quart of average daily receipts.....	0.3	0.7	2.5	0.3
Per quart of average daily sales of milk and cream.....	0.6	1.1	3.1	0.4

¹ This ratio is of a company operating a wholesale business exclusively.

² Pasteurization of milk only.

³ Based on volumes of milk and cream which were assumed to be in quart units only.

⁴ Based on an operating time of 5½ hours.

⁵ Data on floor space were available for but 10 companies.

Computed from data contained in the designers' report and plant appraisals.

Notwithstanding the stipulations enumerated above, it is evident from these data that operations in a central plant, large enough to service the entire market, could be carried on more expeditiously than by a number of firms competing against one another. Certainly the variations in sales of the one enterprise would be of considerably less magnitude than those of competitive firms, operating not only under definitely established variations due to consumptive habits but to fluctuating volumes as influenced by competition as well. The

expected utilization of capacity in the proposed plant to a much fuller extent than is shown for the competitive plants would have a very tangible effect upon plant costs, and in turn, prices to consumers and payments to producers.

The question might well be asked as to what possible benefits producers and consumers could realize from operations of a central plant and unified delivery system. If costs of operations actually could be lowered, it would follow that both groups would stand to gain. The designers went so far as to predict that operations could be carried on at a spread of 3.1 cents per quart, and thus pay the producers 35 percent more for their milk, which was considered as 2.5 cents per quart as of the spring of 1934, yet effect a saving of over \$2,000,000 a year to the consumers through reductions in prices of milk, cream, and ice cream, and still leave sufficient moneys to retire the investment of the existing plants ⁷⁵ in about 19 years.

The designers submitted two schedules of estimated revenues from operation of the unified system, the one based upon prices prevailing during the latter part of 1934, and the other upon prices which the designers deemed feasible in view of the estimated costs of operation, and constituting reductions from the prevailing prices for certain commodities as follows:

Milk sold wholesale and retail, 2 cents per quart.

Cream sold retail, 8 cents per quart; cream sold wholesale, 5 cents per quart.

Ice cream sold retail, 15 cents per gallon; ice cream sold wholesale, 10 cents per gallon.

With reduced prices for the above-named products, but with prices unchanged for butter, cottage cheese, and dry skim milk, it was contemplated that the daily revenue from sales would amount to about \$37,298, as compared with \$42,817 under prices then prevailing in the market. (See table 68.) The determination of more exact revenue estimates would involve adjustments with respect to revenues from miscellaneous product sales, proportions actually sold wholesale and retail, prices and quantities sold in different sized units, and prices and quantities of the several qualities sold. While the volumes used in obtaining these estimates are those which were anticipated under the unified system and not those actually sold by the competitive companies, the latter figure may be taken as indicative of the revenues which the several distributors would have received had they sold the same volume of products. On this basis, it would appear that the costs of milk products to consumers could be reduced about \$5,500 daily.

From the estimated daily revenue of \$37,298 under reduced prices (or \$42,817 with unchanged prices) operating expenses, estimated at about \$11,410 daily, would be deducted, leaving approximately \$25,900 from which to pay producers and provide for nonoperating charges. Assuming that nonoperating charges would amount to one-eighth of a cent per quart, returns to producers would be increased approximately 14 cents per hundredweight ⁷⁶ under the reduced price schedule, or approximately 25 cents per hundredweight if prices were unchanged.

⁷⁵ No salvage value of buildings or equipment, or sales value of land, was figured in this connection.

⁷⁶ Computed as follows: The estimated total daily revenue, \$37,298.30, is divided by the estimated daily volume of all products, 688,377 quarts, which gives an average selling price of 5.42 cents per quart. Subtracting from this quotient the calculated unit cost of operation of 1.65 cents per quart (see table 64) and nonoperating charges of 0.125 cent, leaves 3.645 cents per quart as the price to the producer. This is equivalent to \$1.69 per hundredweight as compared with an actual average price of \$1.55 paid producers during 1934.

TABLE 68.—Estimated gross revenues from the operation of the unified system based upon prices prevailing during the latter part of 1934 and upon a proposed schedule of reduced prices ¹

Commodity ²	Volume	Prevailing prices		Proposed prices		Revenue from prevailing prices		Revenue from proposed prices	
		Retail	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail	Wholesale
Fluid milk, all grades (quarts)-----	232,558	\$0.10	\$0.09	\$0.08	\$0.07	\$19,767.40	\$3,139.56	\$15,813.92	\$2,441.88
Cream, all grades (quarts)-----	6,800	.48	.40	.40	.35	2,632.00	390.00	2,210.00	341.25
Ice cream (gallons)-----	3,770	1.40	1.00	1.25	.90	3,770.00	3,770.00	3,770.00	3,393.00
Cottage cheese (pounds)-----	5,000	.05	.04	.05	.04	212.50	30.00	212.50	30.00
Butter (pounds)-----	20,500	.35	.32	.35	.32	7,883.75	1,272.00	7,883.75	1,272.00
Dry skim milk (pounds)-----	74,000				.05		3,700.00		3,700.00
Total-----						30,515.65	12,301.56	29,120.17	11,178.13
Total wholesale and retail-----						42,817.21		37,298.30	

¹ The designers assumed that ice cream and dry skim milk would be sold wholesale only and that the other products listed here would be sold on the following basis: Wholesale 15 percent, retail 85 percent. Since the sales records of 20 companies show that 16.9 percent of all fluid milk, 27.7 percent of all cream, 85.6 percent of cottage cheese, and 52.7 percent of butter were sold wholesale during the first 4 months of 1934, it is probable that the revenues as shown are overstated by about \$445 as estimated from prevailing prices, and by about \$430, as estimated from the reduced prices. The understatement in the revenue estimates attributable to the exclusion of income from miscellaneous product sales cannot be determined.

² Differences in prices due to quality and quantity differentials were not taken into consideration. As a result, the estimated revenues are understated in an undetermined amount.

³ This price is considerably below that prevailing during the period involved. The revenue estimates are therefore understated in this respect.

Taken from the designers' report.

It should be emphasized that the figures submitted above must be interpreted as rough estimates only. In the first place, the designers assumed in their price calculations that the same volume of milk, cream, and ice cream would be sold at the prevailing level of prices as at the contemplated prices. This assumption is obviously subject to modification. In the second place, the accuracy of the results depends upon the reliability of the estimates for the operating as well as the nonoperating charges, which are difficult to verify under a hypothetical set-up. Subject to these reservations, these estimates show that both producers and consumers would derive rather marked benefits from the unified system. Whether the results would be borne out in actual operation cannot be determined. In this connection, it should be noted that it probably would not be feasible to return a very substantial portion of the estimated savings to producers, due to the probability of a marked increase in supply if this were done, both from within the present milk shed and from expansion of the supply area. However, producers probably would stand to gain because of a more orderly marketing process, and perhaps through some expansion of their market if a material increase in consumption resulted from the reduced prices.

The foregoing has set forth the description, estimated capital expenditures, and costs of operation of the proposed unified handling system for Milwaukee. Costs of operation and the like are based upon the assumption that an efficient management could be set up. Depending upon the efficiency of management and the degree of freedom given such management in operating the central system, the foregoing figures may be taken as a fair appraisal of the operations of the system under efficient management.

Certain questions arise as to the feasibility of the proposed system in view of its relationships with producers and consumers. It would appear that unification of distribution facilities would tend to affect producers principally in the disruption of their relationships with distributors. That the effectiveness in bargaining power of producers would be impaired cannot be denied. Their associations undoubtedly would continue to represent them in negotiations with the marketing agency, with prices determined in the customary manner in light of existing supply and demand conditions, modified by local or State regulations, as the case may be. At the same time, the replacement of a number of marketing agencies by one organization would mean that bargaining power probably would be effective only insofar as influenced by competition between buyers for other markets, as for instance, Chicago, and competition for alternative uses. Hence in the absence of regulatory measures, a discriminatory price policy might force a reduction in producers' price temporarily, notwithstanding the differentiation in quality which exists and would exist between milk delivered into the market and that used strictly for manufacturing purposes. Additional support is given to this statement when it is recognized that a large volume of milk over and above fluid requirements would be handled daily by the proposed marketing agency. However, it seems reasonable to assume that an efficient management would be careful not to jeopardize the position of producers.

It would appear that, in the absence of restraint in conduct of management, the interests of consumers under a monopolized system of milk handling could be as easily jeopardized as those of producers.

Sound judgment probably would dictate policies fair to the public, but it must be remembered that the bargaining power of consumers is largely nullified when alternative sources of supply are eliminated.

It would follow as a logical presumption that, as far as producers and consumers might be concerned, successful operation of the proposed system would hinge closely upon the degree to which these groups were permitted to participate in the formulation and execution of policy. Public opinion probably does not crystallize with sufficient celerity over short periods of time to warrant dependence upon it as a sole protective device.

There is another angle incidental to consumer reactions which should not be overlooked. Wholesomeness of the milk supply is associated to a considerable extent with trade names on bottles or bottle caps. In the absence of price competition between dealers, popularity of specific brands is dependent largely upon what is accepted as quality differentials between the several products. For that matter, the effects of moderate price competition are somewhat nullified by the continued preference on the part of consumers for those particular brands which they are accustomed to buy. Differences in quality of many products represent a real basis for discrimination. Yet the significance attached to brands of milk as a criterion of quality probably is founded more on apparent than real differences, for it is generally recognized that with uniform handling by dealers under specific sanitary requirements, the quality of definite grades of milk can vary only within well-defined and narrow limits, which, with the exception of the cream line, are probably indistinguishable to the housewife. Accustomed as she is in the selection of products with reference to brands and trade marks, however, dissatisfaction with one brand prompts the shifting to another which she believes more nearly measures up to her standards.

The foregoing suggests a tangible obstacle which would need to be met under a unified system of milk handling where but one grade of each product, as grade B milk, would be distributed. However, assuming that the products handled were of such high quality as to meet the demands of the most meticulous customer, in fact to be of the highest quality readily obtainable, and yet low enough in price to encourage a heavier consumption, it is apparent that this difficulty would disappear as soon as the facts of the situation were brought to light.

In any case, it should be recognized that a great deal more work needs to be done before other than tentative conclusions should be drawn with respect to reorganization of the milk-distributing business. In the first place, it should be evident that centralization of the milk business, whether under a publicly owned monopoly or under a privately owned monopoly, subject to public control, needs to be carefully considered on its merits. It would be well to proceed cautiously. In the second place, it is highly probable that there are many economies that can be effected in milk distribution without necessarily abandoning the present system. In the third place, centralization of the milk business, such as is analyzed in this report, would undoubtedly raise many new problems, many of which could be answered only on the basis of experience in operating such a system.

No.	Name of the person or firm	City
1	John A. Smith	Chicago
2	James B. Jones	St. Paul
3	William C. Brown	Minneapolis
4	Robert D. White	St. Louis
5	Thomas E. Green	St. Paul
6	Charles F. Black	Chicago
7	Edward G. Gray	St. Paul
8	Frank H. Hall	St. Louis
9	George I. King	Chicago
10	Henry J. Lee	St. Paul
11	Isaac K. Miller	St. Louis
12	Joseph L. Moore	Chicago
13	Samuel N. Parker	St. Paul
14	David O. Reed	St. Louis
15	John P. Scott	Chicago
16	William R. Taylor	St. Paul
17	Charles S. Walker	St. Louis
18	Edward T. Young	Chicago
19	Frank V. Ziegler	St. Paul
20	George W. Adams	St. Louis
21	Henry X. Baker	Chicago
22	Isaac Y. Carter	St. Paul
23	Joseph Z. Davis	St. Louis
24	Samuel A. Evans	Chicago
25	David B. Fisher	St. Paul
26	John C. Gibson	St. Louis
27	William D. Hall	Chicago
28	Charles E. Ingram	St. Paul
29	Edward F. Jones	St. Louis
30	Frank G. Keith	Chicago
31	George H. Lester	St. Paul
32	Henry I. Martin	St. Louis
33	Isaac J. Nelson	Chicago
34	Joseph K. Olsen	St. Paul
35	Samuel L. Parker	St. Louis
36	David M. Quinn	Chicago
37	John N. Reed	St. Paul
38	William O. Scott	St. Louis
39	Charles P. Taylor	Chicago
40	Edward Q. Walker	St. Paul
41	Frank R. Young	St. Louis
42	George S. Ziegler	Chicago
43	Henry T. Adams	St. Paul
44	Isaac U. Baker	St. Louis
45	Joseph V. Carter	Chicago
46	Samuel W. Davis	St. Paul
47	David X. Evans	St. Louis
48	John Y. Fisher	Chicago
49	William Z. Gibson	St. Paul
50	Charles A. Hall	St. Louis
51	Edward B. Ingram	Chicago
52	Frank C. Jones	St. Paul
53	George D. Keith	St. Louis
54	Henry E. Lester	Chicago
55	Isaac F. Martin	St. Paul
56	Joseph G. Nelson	St. Louis
57	Samuel H. Olsen	Chicago
58	David I. Parker	St. Paul
59	John J. Quinn	St. Louis
60	William K. Reed	Chicago
61	Charles L. Scott	St. Paul
62	Edward M. Taylor	St. Louis
63	Frank N. Walker	Chicago
64	George O. Young	St. Paul
65	Henry P. Ziegler	St. Louis
66	Isaac Q. Adams	Chicago
67	Joseph R. Baker	St. Paul
68	Samuel S. Carter	St. Louis
69	David T. Davis	Chicago
70	John U. Evans	St. Paul
71	William V. Fisher	St. Louis
72	Charles W. Gibson	Chicago
73	Edward X. Hall	St. Paul
74	Frank Y. Ingram	St. Louis
75	George Z. Jones	Chicago
76	Henry A. Keith	St. Paul
77	Isaac B. Lester	St. Louis
78	Joseph C. Martin	Chicago
79	Samuel D. Nelson	St. Paul
80	David E. Olsen	St. Louis
81	John F. Parker	Chicago
82	William G. Quinn	St. Paul
83	Charles H. Reed	St. Louis
84	Edward I. Scott	Chicago
85	Frank J. Taylor	St. Paul
86	George K. Walker	St. Louis
87	Henry L. Young	Chicago
88	Isaac M. Ziegler	St. Paul
89	Joseph N. Adams	St. Louis
90	Samuel O. Baker	Chicago
91	David P. Carter	St. Paul
92	John Q. Davis	St. Louis
93	William R. Evans	Chicago
94	Charles S. Fisher	St. Paul
95	Edward T. Gibson	St. Louis
96	Frank U. Hall	Chicago
97	George V. Ingram	St. Paul
98	Henry W. Jones	St. Louis
99	Isaac X. Keith	Chicago
100	Joseph Y. Lester	St. Paul

APPENDIX

TABLE 69.—*Index numbers of seasonal variation in the volume of Grade B milk purchased from producers, 1928-34*

[Average daily purchases for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928-----	101.3	103.7	106.6	110.5	114.1	119.5	98.5	87.1	90.2	87.7	88.0	92.8
1929-----	94.7	98.8	102.1	106.2	114.1	127.1	105.0	91.3	87.8	86.8	88.9	97.2
1930-----	97.8	100.6	103.1	105.9	114.6	115.1	93.8	86.2	89.4	91.9	99.0	102.6
1931-----	106.6	100.8	105.1	108.8	112.2	109.5	88.4	85.0	87.8	103.6	96.6	95.6
1932-----	103.4	106.4	107.0	109.6	108.3	101.6	87.9	91.7	94.6	95.1	95.8	98.6
1933-----	108.7	100.6	109.8	110.0	94.6	111.2	97.1	99.1	96.9	97.6	81.9	92.5
1934-----	99.4	100.5	101.0	103.5	110.8	113.8	101.3	96.4	95.7	99.1	91.1	87.4
Average-----	101.7	101.6	105.0	107.8	109.8	114.0	96.0	91.0	91.8	94.5	91.6	95.2

Based upon Milwaukee Health Department data.

TABLE 70.—*Index numbers of seasonal variation in the volume of Grade-A milk purchased from producers, 1928-34*

[Average daily purchases for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928-----	97.2	102.5	106.5	111.1	112.0	115.9	99.5	91.9	92.5	88.8	88.3	93.8
1929-----	98.2	101.5	105.5	107.8	110.4	118.4	101.7	94.1	89.5	88.7	89.0	94.8
1930-----	97.6	100.8	104.1	106.0	112.5	111.5	94.8	89.5	88.4	96.8	97.6	100.4
1931-----	100.2	105.1	101.6	112.6	116.6	116.2	94.1	93.0	93.6	89.7	89.2	88.1
1932-----	93.9	94.9	98.6	103.2	107.3	103.1	93.3	96.2	99.1	100.3	102.6	107.5
1933-----	110.6	100.9	108.5	110.3	101.7	110.8	97.9	94.7	90.3	93.5	87.2	93.6
1934-----	93.6	97.3	99.1	104.9	110.2	110.7	100.8	97.4	97.5	98.2	96.3	94.0
Average-----	98.8	100.5	103.4	108.0	110.1	112.4	97.4	93.8	93.0	93.7	92.9	96.0

Based upon Milwaukee Health Department data.

TABLE 71.—*Index numbers of seasonal variation in the volume of cream purchased from producers and creameries, 1928-34*

[Average daily purchases for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928-----	80.8	93.6	101.3	112.3	125.2	140.3	93.4	100.9	95.9	87.3	80.8	83.2
1929-----	86.8	92.4	107.5	107.6	125.9	141.9	119.8	102.8	84.2	72.1	75.9	83.1
1930-----	86.9	101.1	107.2	115.9	100.4	142.6	118.6	95.3	77.8	79.9	81.1	93.2
1931-----	88.7	99.9	112.6	120.8	131.4	133.4	102.8	81.2	77.7	92.8	86.4	72.3
1932-----	79.2	90.0	96.7	102.7	129.2	134.4	104.2	91.4	88.0	87.5	121.5	75.2
1933-----	126.3	108.5	113.1	107.0	126.4	83.2	99.6	78.5	98.1	82.9	64.7	111.7
1934-----	89.5	98.0	111.0	115.7	116.6	105.1	84.5	123.4	113.3	115.7	54.4	72.8
Average-----	91.2	98.4	107.1	111.7	122.2	125.8	103.2	96.2	90.7	88.3	80.7	84.5

Based upon Milwaukee Health Department data.

TABLE 72.—*Index numbers of seasonal variation in the volume of market milk sold, 1928-34*

[Average daily purchases for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928.....	95.9	94.7	100.5	99.8	102.0	99.4	94.9	98.7	101.3	105.6	105.2	102.0
1929.....	97.2	100.1	100.7	101.0	101.9	99.7	97.4	98.4	101.6	101.8	102.1	98.1
1930.....	101.5	102.8	104.0	103.0	101.7	99.6	95.3	96.1	99.8	99.6	100.0	96.6
1931.....	97.4	100.1	101.3	101.0	100.7	97.9	97.8	97.9	101.0	101.1	102.2	101.6
1932.....	101.2	104.0	105.0	105.1	104.6	102.1	94.5	95.3	97.0	98.2	96.7	96.3
1933.....	105.3	108.2	106.6	101.8	98.3	99.4	95.3	95.4	98.6	99.2	95.5	96.4
1934.....	97.0	99.1	101.2	101.5	102.6	101.3	98.3	99.7	100.0	101.2	100.3	97.8
Average.....	99.3	101.3	102.7	101.9	101.7	99.9	96.2	97.4	99.9	101.0	100.3	98.4

Based upon Milwaukee Health Department data.

TABLE 73.—*Index numbers of seasonal variation in the volume of Grade A milk sold, 1928-34*

[Average daily sales for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928.....	99.2	105.5	102.3	99.7	99.9	100.2	93.3	93.1	98.9	103.5	103.4	101.0
1929.....	104.0	105.0	106.5	105.0	105.1	101.1	93.4	93.1	100.6	96.3	95.5	94.4
1930.....	97.7	99.4	100.1	98.8	97.2	93.4	85.9	92.2	104.0	109.1	111.3	110.9
1931.....	99.6	103.9	105.2	103.4	102.5	99.0	92.8	93.8	98.0	100.3	99.1	102.4
1932.....	102.1	103.5	105.6	104.3	104.1	103.0	93.9	93.7	95.3	98.0	98.4	98.1
1933.....	117.3	103.2	105.0	100.0	92.9	97.2	89.8	91.0	98.4	102.9	101.5	100.8
1934.....	94.0	97.0	98.0	98.6	99.6	99.9	97.2	97.7	100.1	104.1	106.9	106.9
Average.....	102.0	102.5	103.2	101.4	100.2	99.1	92.3	93.5	99.3	102.0	102.3	102.2

Based upon Milwaukee Health Department data.

TABLE 74.—*Index numbers of seasonal variation in the volume of certified milk sold, 1928-34*

[Average daily sales for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928.....	155.9	132.9	122.3	115.0	103.4	98.8	79.9	81.6	81.9	80.5	76.9	70.9
1929.....	105.4	104.9	100.9	97.1	96.9	90.5	80.7	74.6	97.2	71.7	132.3	147.8
1930.....	131.1	130.2	127.1	121.2	114.9	102.1	84.5	81.5	84.8	80.0	73.5	69.1
1931.....	72.5	69.1	112.8	120.1	120.8	107.0	95.3	91.6	110.0	93.3	109.3	98.2
1932.....	112.0	126.1	131.7	129.5	113.5	98.6	89.8	76.8	79.0	81.1	81.5	80.4
1933.....	79.1	101.7	113.5	100.9	93.5	102.6	92.5	91.4	104.7	84.9	113.6	121.6
1934.....	106.2	114.1	114.0	119.4	109.0	102.5	90.8	85.3	87.0	89.3	88.6	93.8
Average.....	108.9	111.3	117.5	114.7	107.4	100.3	87.6	83.3	92.1	83.0	96.5	97.4

Based upon Milwaukee Health Department data.

TABLE 75.—*Index numbers of seasonal variation in the volume of cream sold, 1928-34*

[Average daily sales for the year=100 percent]

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
1928.....	114.6	117.5	109.9	101.7	106.4	101.7	89.0	85.4	87.3	91.3	98.5	96.7
1929.....	97.4	103.1	105.6	106.3	117.0	103.1	89.7	90.2	90.2	91.7	104.1	101.6
1930.....	105.9	108.0	110.3	111.0	110.2	94.1	86.0	83.1	90.6	96.6	102.0	102.2
1931.....	104.7	107.0	108.6	112.2	110.4	101.5	86.1	91.4	90.5	94.1	98.4	95.1
1932.....	112.9	112.3	112.6	111.4	110.7	98.7	89.7	82.5	86.7	92.6	96.0	93.9
1933.....	98.3	113.2	108.5	120.3	102.8	90.4	86.5	85.4	88.5	91.4	106.9	107.8
1934.....	95.7	102.4	106.7	109.0	110.9	95.5	88.6	91.1	94.8	96.9	103.6	104.8
Average.....	104.2	109.1	108.9	110.3	109.9	97.8	87.9	87.0	89.8	93.5	101.3	100.3

Based upon Milwaukee Health Department data.

TABLE 76.—*Relative value of commodities sold on wholesale and retail routes of distributors during the week ending Apr. 28, 1934*

Commodity	Unit	Type of sale	
		Whole-sale	Retail
		<i>Percent</i>	<i>Percent</i>
Regular milk	Gallons	8.736	
Do.	Quarts	29.729	61.607
Do.	Pints	1.350	1.938
Do.	$\frac{1}{2}$ pints	4.340	
Grade A milk	Gallons	.080	
Do.	Quarts	.603	6.175
Do.	Pints	.204	.572
Do.	$\frac{1}{2}$ pints	.389	
Certified milk	Quarts	.047	.338
Do.	Pints	.001	.034
Do.	$\frac{1}{2}$ pints	.001	
Irradiated Vitamin D milk	Gallons	.002	
Do.	Quarts	.403	6.182
Do.	Pints	.017	.045
Do.	$\frac{1}{2}$ pints	.527	
Certified Vitamin D milk	Quarts	.018	.676
Do.	Pints		.030
Do.	$\frac{1}{2}$ pints	.071	
Acidophilus milk	Quarts	.001	.021
Do.	Pints	.007	.011
Bulgarian milk	Quarts		.009
Do.	Pints		.002
Do.	$\frac{1}{2}$ pints	.007	
Bulgarian buttermilk	Quarts		.007
Do.	Pints		.001
Do.	$\frac{1}{2}$ pints	.013	
Acidophilus buttermilk	Quarts		.006
Do.	Pints		.001
Chocolate milk	Quarts	.174	1.458
Do.	Pints	.321	.391
Do.	$\frac{1}{2}$ pints	1.514	.142
Skim milk	Gallons	.313	
Do.	Quarts	.005	.041
Do.	Pints	.017	
Skim-milk powder	Pounds	.042	
Churned buttermilk	Gallons	.333	
Do.	Quarts	.823	1.280
Do.	Pints	.052	.003
Do.	$\frac{1}{2}$ pints	.059	
Do.	Pounds	.040	
Cultured buttermilk	Gallons	.023	
Do.	Quarts	.082	.039
Do.	Pints	.006	
Do.	$\frac{1}{2}$ pints	.015	
Condensed milk	Cases	3.301	
Condensed milk, 8 percent	Pounds	.009	
Cream, 18 percent	Gallons	6.580	
Do.	Quarts	1.828	1.779
Do.	Pints	.606	.898
Do.	$\frac{1}{2}$ pints	1.150	.401
Sour cream, 19 percent	Gallons	.019	
Do.	Quarts	.014	.019
Do.	Pints	.195	.135
Do.	$\frac{1}{2}$ pints	.530	.143
Cream, 20 percent	Gallons	.035	
Cream, 22 percent	Gallons	.044	
Cream, 24 percent	Gallons	.110	
Do.	Quarts	.085	.031
Do.	Pints	.022	.137
Do.	$\frac{1}{2}$ pints	4.388	4.532
Cream, 25 percent	Gallons	.124	
Cream, 28 percent	Gallons	.716	
Do.	Quarts	.085	.004
Do.	Pints	.053	.003
Do.	$\frac{1}{2}$ pints	.088	.148
Cream, 32 percent	Gallons	.861	
Do.	Quarts	.290	.044
Do.	Pints	.096	.031
Do.	$\frac{1}{2}$ pints	2.433	1.213
Certified cream, 40 percent	Quarts	.004	.002
Do.	Pints		.001
Do.	$\frac{1}{2}$ pints	.008	.011
B. B. cream	Gallons	.586	
Do.	Quarts	.040	.002
Unsalted butter	Pounds	6.208	4.899
Do.	$\frac{1}{2}$ pounds	.002	

TABLE 76.—*Relative value of commodities sold on wholesale and retail routes of distributors during the week ending Apr. 28, 1934—Continued*

Commodity	Unit	Type of sale	
		Whole-sale	Retail
		<i>Percent</i>	<i>Percent</i>
Salted butter.....	Pounds.....	17.381	2.941
Do.....	½ pounds.....	.020	.032
Cottage cheese.....	Jars.....	.289	
Do.....	Pounds.....	.546	.321
Do.....	1-pound packages.....	.009	.021
Do.....	2-pound packages.....	.076	.212
Do.....	Tubs.....	.137	
Creamed cottage cheese.....	Pounds.....	.071	.099
Do.....	Packages.....	.081	.119
Do.....	Glasses.....	.313	.422
Cream cheese.....	Pounds.....	.022	.004
Do.....	Packages.....	.022	.026
Lakeshire cheese.....	Pounds.....	.006	.031
Soft curd.....	Quarts.....	.059	.023
Do.....	Pints.....		.004
Bakers' special cheese.....	Pounds.....	.053	.004
Miscellaneous.....		.001	.299
		100.000	100.000

Based upon distributors' sales records.

TABLE 77.—*Variations in daily sales of products sold wholesale by distributors during the week ended Apr. 28, 1934*

[Average daily sales for the week=100 percent]

Commodity	Unit	Sun-day	Mon-day	Tues-day	Wed-nesday	Thurs-day	Friday	Satur-day
		<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk, regular.....	Quarts.....	79.0	102.2	101.8	101.5	101.9	104.9	108.7
Do.....	Pints.....	69.6	119.1	115.6	116.5	117.6	112.6	49.0
Do.....	½ pints.....	38.4	117.6	118.6	114.8	121.4	121.5	67.7
Milk, Grade A.....	Quarts.....	83.9	106.1	100.3	105.6	106.4	103.8	96.5
Do.....	½ pints.....	21.9	120.1	118.4	120.1	110.4	119.2	89.9
Milk, irradiated.....	½ pints.....	14.6	125.8	138.0	132.8	135.1	128.4	25.3
Cream, 18 percent.....	Quarts.....	77.0	99.9	95.9	97.7	98.8	101.5	129.2
Do.....	Pints.....	97.2	93.2	89.3	100.6	87.2	107.5	124.3
Do.....	½ pints.....	135.8	86.0	84.5	85.6	87.8	95.7	124.6
Do.....	Pint equivalent.....	102.1	93.7	90.7	93.6	93.0	100.2	126.7
Cream, 24 percent.....	½ pints.....	112.0	95.4	86.9	88.7	88.5	97.8	130.7
Cream, 31 percent.....	½ pints.....	172.5	93.1	65.9	65.3	76.9	78.0	148.3
Butter, salted.....	Pounds.....	41.4	323.7	62.7	58.1	62.6	79.4	72.1
Butter, unsalted.....	Pounds.....	84.4	103.5	88.1	103.3	104.3	99.6	116.8
Cottage cheese.....	Pounds.....	45.0	74.6	99.2	101.2	100.8	183.1	96.1
Do.....	Jars.....	14.3	39.6	51.5	61.2	117.6	287.4	58.4

Based upon the distributors' sales records.

TABLE 78.—Variations in daily sales of products sold retail by distributors during the week ending Apr. 28, 1934

[Average daily sales for the week=100 percent]

Commodity	Unit	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk, regular	Quarts	99.7	97.9	98.4	100.4	101.3	99.0	103.3
Do	Pints	58.2	115.8	102.8	118.9	122.2	98.6	83.5
Milk, Grade A	Quarts	101.5	96.9	99.7	99.8	100.0	101.0	101.1
Milk, Vitamin D	do	99.1	97.8	101.1	101.1	100.9	101.0	99.0
Cream, 18 percent	do	93.8	50.9	69.7	83.8	80.4	82.1	239.3
Do	Pints	131.1	75.5	79.3	91.0	86.0	84.7	152.4
Do	½ pints	159.9	76.5	91.3	88.0	88.6	89.3	106.4
Do	Pint equivalents	115.7	61.7	76.3	86.3	83.4	84.1	192.5
Cream, 24 percent	Quarts	106.9	68.1	97.2	97.2	111.8	85.1	133.7
Do	Pints	113.5	82.4	99.0	104.6	103.5	84.6	112.4
Do	½ pints	152.2	80.6	87.4	93.2	91.9	90.8	113.9
Do	Pint equivalents	150.2	80.4	87.9	93.6	92.6	90.5	104.8
Cream, 32 percent	Quarts	180.6	97.8	45.2	45.2	67.7	105.4	158.1
Do	Pints	154.9	53.4	85.5	69.5	133.6	85.5	117.6
Do	½ pints	307.9	51.1	53.4	63.1	66.9	61.8	95.8
Do	Pint equivalents	299.9	52.7	53.9	62.6	68.5	63.9	98.5
Plain cottage cheese	Pounds	81.7	59.2	75.3	87.0	87.8	177.1	131.9

Based upon the distributors' sales records.

TABLE 79.—Variations in daily sales of milk and cream sold wholesale and retail by distributors during the week ending Apr. 28, 1934

[Average daily sales for the week=100 percent]

Commodity	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Milk:							
Retail	98.4	98.3	98.4	101.1	101.7	99.7	102.4
Wholesale	72.6	106.0	105.2	102.1	107.6	110.1	96.4
Average	91.8	100.3	100.1	101.4	103.2	102.3	100.9
Cream:							
Retail	166.7	71.6	76.7	86.7	84.7	85.1	130.5
Wholesale	94.9	97.3	95.4	95.2	99.1	98.3	119.8
Average	126.9	85.9	87.0	91.4	92.7	91.5	124.6
Milk and cream:							
Retail	107.7	94.7	95.5	99.1	99.3	97.5	106.2
Wholesale	80.7	102.8	101.6	99.6	104.5	105.8	105.0
Average	99.1	97.3	97.4	99.3	101.0	100.1	105.8

Based upon the distributors' sales records.

